The Electrical Industry's Weekly Magazine September 21, 1959

# Electrical World

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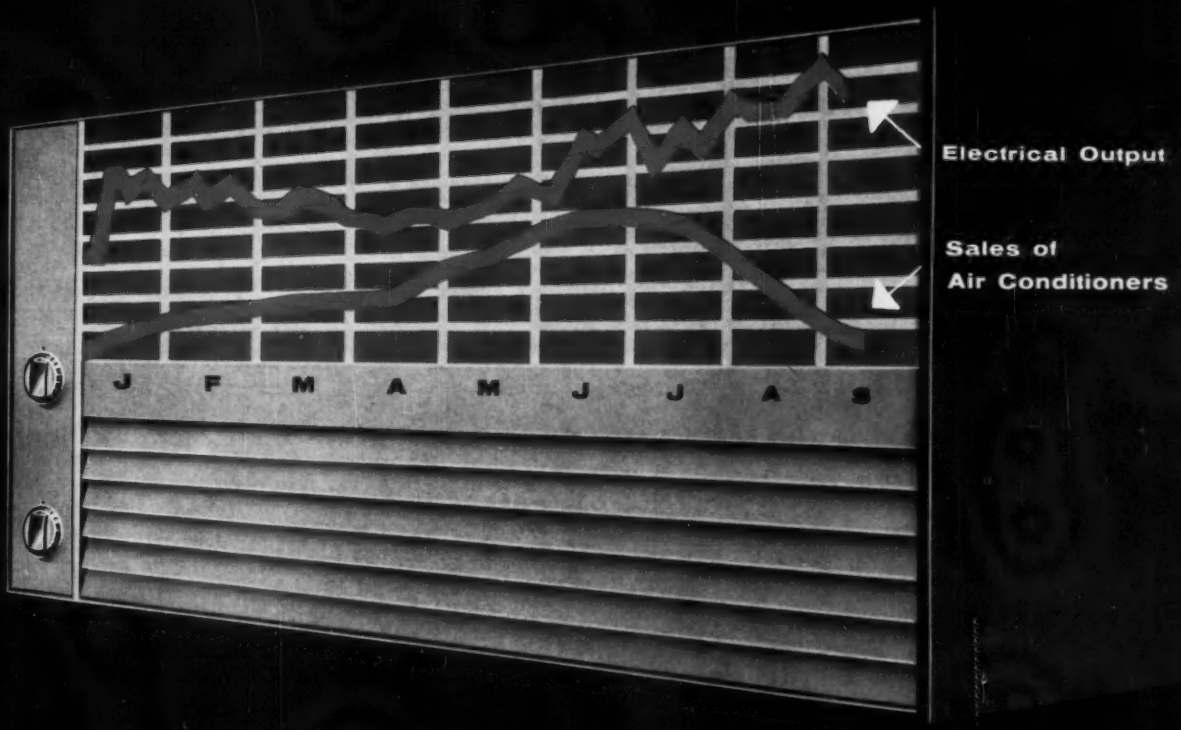


## Air Conditioning Helps Boost Summer Peaks

...page 68

## TVA Bill Eases Fears of Neighbors... p 71

## Fuel Cell Reaches Practical Stage... p 76

UNIV MICROFILMS INC
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EDITORIAL DEPT
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# A program of advanced study for selected men in the utility industry

General Electric's Power Systems Engineering Course for utility engineers stimulates interchange of ideas on problems affecting the electrical industry.

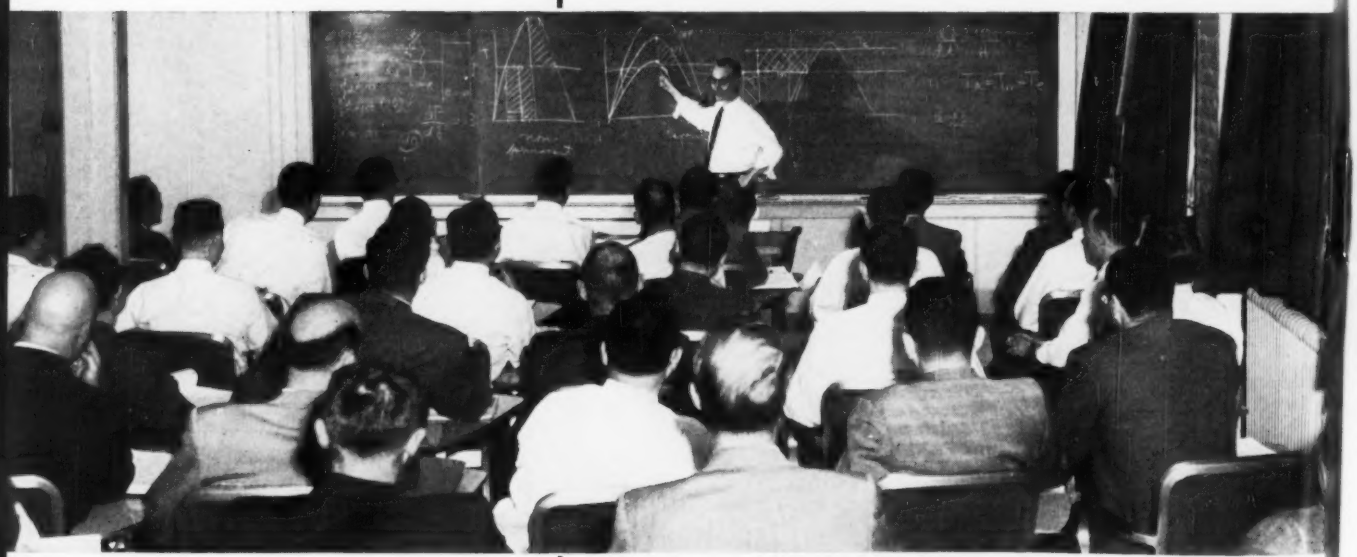
One of the most difficult problems confronting electric utilities today is that of training manpower to keep pace with the changing engineering content of fast-growing utility power systems. Beyond the challenges of expanding generation, transmission and distribution facilities, utilities must plan for innovation—automated steam stations, more sophisticated system interconnections, extra high voltage transmission, nuclear power, trends toward integrated systems. These areas all emphasize the need for better trained technical people.

General Electric recognizes the magnitude of the problem these companies must solve. And as part of its service to the industry, continues to assist utilities in their training activities.

One outstanding example of this G-E service is the Power Systems Engineering Course—a program of advanced study for selected utility engineers. Now beginning its eleventh year, this Course embraces technical phases of power systems engineering, current industry problems, and future system planning. Men selected by utilities themselves take part in an intensive 30-week program, *studying problems related to their own companies,* plus those common to the industry. In addition to classroom work, utility engineers participate in seminars and lectures; study system problems on digital computers and network analyzers; and tour G-E manufacturing plants. Throughout the Course, these men profit by exchanging ideas with G-E engineers and course members from other utilities.

Up to 1959, 210 engineers from outside firms, including 64 utilities, had completed the Power Systems Engineering Course. Graduates return to their companies better equipped to assume greater engineering responsibilities. They are able to pass on this new-found information to their associates; they have made themselves more valuable to their companies and the industry.

Programs like this represent another part of the G-E *Added Value* package made available to purchasers of electrical apparatus . . . Added Values that pay off for General Electric, utilities, and the customers they both serve. 301-409



**POWER SYSTEMS ENGINEERING COURSE** participant contributes directly to his company's engineering activity by working on immediate or long-range problems related to his system. Graduates multiply program's effectiveness by passing on Program information to others.

MORE POWER TO AMERICA

GENERAL ELECTRIC

# Electrical World

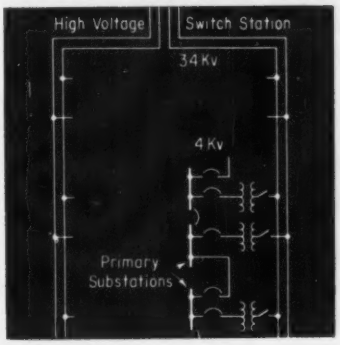
Vol. 152, No. 12 SEPTEMBER 21, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

## In This Week's Issue

p 71

p 76




p 74

CURRENT EVENTS

### Air Conditioning Helps Boost Summer Peaks

Although steel strike shaves off highs for some systems, warm weather more than offsets it for U. S. as a whole....p 68

### TVA Bond Bill Eases Fears of Neighbors

Surrounding power companies don't care for the measure, but they hail the first formal limitation on TVA's area.....p 71

GENERATION

### Spaced Shields Improve Turbine Heat Rate

*George W. Switzer, Gilbert Associates, Inc.*

Simple, low-cost measure stops heat loss from extraction steam to exhaust steam in central station unit.....p 78

### Fuel Cell Reaches Practical Stage

Bacon fuel cell has 5-kw output at 24-v, with water as by-product. Free energy efficiency is 50%-65%.....p 76

INDUSTRIAL ENGINEERING

### 34.5-Kv Industrial System Saves $200,000

*R. H. Rencken, Scientific Design Co, Inc.*

Distribution system for new chemical plant serves an initial load of 15 mva that may grow to 100 mva.....p 74

TRANSMISSION

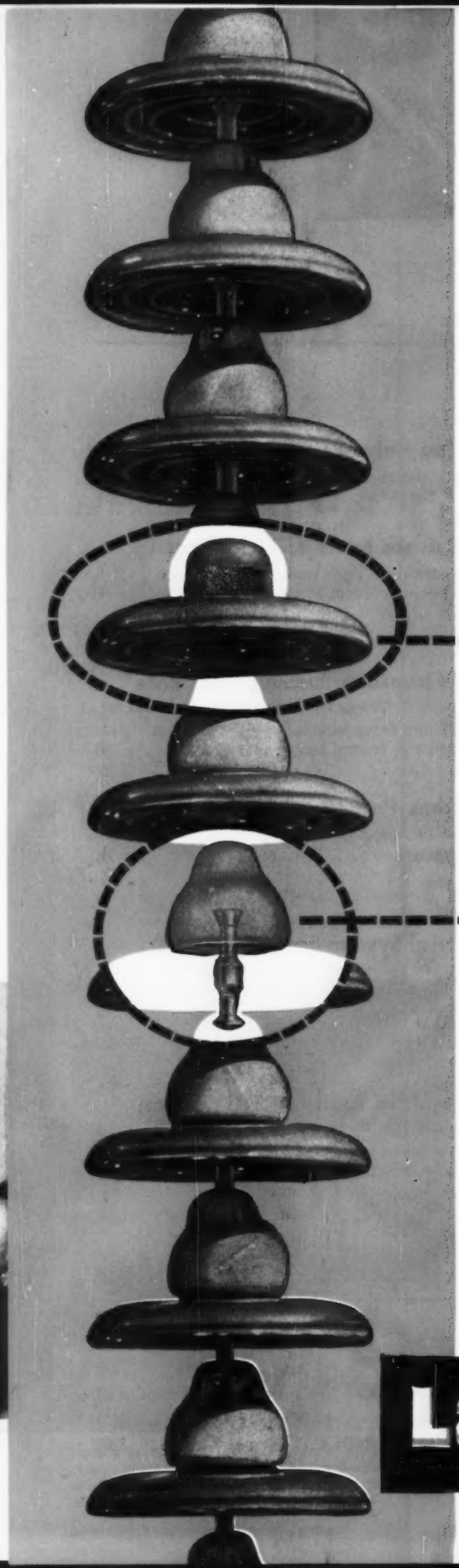
### Twelve Key Trends In Today's Transmission

*S. B. Cary, General Electric Co*

A look at changing patterns of high voltage transmission that set stage for more standardization.....p 80

## Departments

Editorials ..... 67
Electric Utility Methods..... 87
• Electrical Week ..... 21
Engineering Reference Sheet 94
Executive Reader ..... 24
Letters ..... 5
• Management Newsletter ...123
Manufacturers News .....102
New Equipment .....110
News About People.....134
Politics and Public Power... 22
• Procurement & Products .... 99
Readers Service .....112
Selling .....129
INDEX TO ADVERTISERS...140



## GOT AN INSULATOR CORROSION PROBLEM?

Competent transmission system design calls for selection of components matched to each other in useful-life-expectancy. It often is the case, in areas of salt spray and/or industrial contamination, that rusting out of suspension insulators may be the first sign of a line "wearing out"—years before conductors or structures are in need of replacement. For such lines now being constructed or planned, the need for high-line maintenance or future reinsulation—and its high cost in skilled labor, transportation, and materials—can be avoided. Lapp suspension insulators are available, on specification, with cap and bolt components in a variety of corrosion-resistant alloys. We now have a lot of test data and installation records to help us, and you, to predict performance of these metal parts over periods of varying conditions of weather, concentration of corrosive action, prevalence of contamination, leakage currents and corona. Ask your Lapp representative about it—or write direct to us.

## the porcelain is "forever"

Lapp vacuum process porcelain, with balanced compression-glaze "fit," has been proved—over millions of pieces, in thousands of shapes—the "most dependable insulation material on any system." Suspension discs are offered in standard (15,000-lb.) strength, high (25,000-lb.) strength, and heavy-duty shells. Fog-type units in same standard and high strength ratings, for either 5¾" or 6½" spacing.

## the hardware by specification

**FORGED STEEL** hot-dip galvanized, standard for caps and bolts. Smooth contours and uniformity of galvanizing have improved corrosion resistance over earlier insulators.

**MALLEABLE IRON** for caps only. Hot-dip galvanized, it is approximately equivalent to standard forged steel in corrosion resistance.

**LOW-ALLOY STEEL** hot-dip galvanized. For caps and bolts. Offers four to six times greater resistance to corrosion than forged steel. Nominal price premium.

**DUCTILE NI-RESIST** for caps only. Considerably lower in cost than stainless, is second only to stainless in resistance to most forms of atmospheric corrosion.

**STAINLESS STEEL** has highest resistance to corrosion of any material. Used principally for bolts, can be furnished for caps where severity of operating conditions justify the cost.

**ALUMINUM-SILICON-BRONZE** for caps and bolts under special chemical atmospheres where its resistance exceeds that of stainless.

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# LETTERS

## Dreamer's Doghouse Wired for Hound

To the Editor:

Here's a contribution for your Dreamers' Club. Our spaniel looks forward to her fourth comfortable Idaho winter in her electrically-heated dog house. She says other dog owners would be willing to buy a simple kit for installing a 75-w low-temp radiant heating element on the ceiling of an insulated kennel, if only it were available.

The dogweight-actuated microswitch turns on the heat when Queenie enters, and the simple thermostat keeps her comfortable. The outfit plugs into the patio outlet and has a neon pilot to indicate when Queenie is at home.

D. L. Andrews
Idaho Power Co
Boise, Idaho

*This "dream" has had a four-year successful run. Looks like some good off-peak load can be generated if kit suppliers can be lured into the market place.*

## The Union Jack—Long May It Wave

To the Editor:

I would refer you to page 96 of the August 17th issue of Electrical World. The Union Jack is flown upside down! Although we may come ninth in the list of countries using electrical power, we are not yet flying signals of distress! That is what your illustration appears to show us doing. (If you look at the top left hand corner of the flag, the broad white stripe should be at the top and the narrow white stripe at the bottom. You have it the other way up.)

However, with President Eisenhower actually amongst us at this moment, I am sure this terrible error will not impair international relations . . .

John M. Sykes
71 Chaucer Road
Bedford, England

*We extend official regrets, and request that our ambassador assure you that every step will be taken to prevent the recurrence of such an incident.*

**COMING NEXT WEEK** . . . third quarterly special report on Electric Utility Methods jammed full of techniques for utility men in construction, operation, and maintenance.

## DEVELOPED TO MEET YOUR NEEDS:

# 400/800 ampere *Dual Range* CURRENT TRANSFORMER

This new dual range transformer was developed to meet *your* needs. It combines greatly extended range with all these other features of BH-6 Transformers:

**OVAL SHAPED WINDOW** for greatest flexibility in application with the greatest usable opening of any 600 volt current transformer.

**COMPACT DESIGN** makes it easy to mount. It's the smallest, lightest transformer in its class.

**COLOR CODING** . . . BH-6 Transformers are color coded in standard resistor colors for quick identification. (The new 400/800 rating is molded in black.)

**CERTIFICATION OF ACCURACY**. . . A certificate of accuracy test is supplied with all Sangamo current transformers. They arrive ready for you to put on the line.

***you asked for it...*** a 400/800 ampere rating in a BH-6 Current Transformer that could provide extended capacity for future growth after initial installation on the 400 ampere range. By using one or more primary turns, this one transformer can be used on loads ranging from 40 to 1600 amperes.

Now, you can drastically lower your transformer stock levels, sharply reduce expensive changeouts, and get 0.3 accuracy class on all loads from 40 to 1600 amperes.

***DUAL RANGE FEATURE:***

Changing range is as simple as 1-2-3. First, close the short circuiting link. Second, transfer the secondary lead from the 400 to the 800 amp terminal. Third, open the short circuiting link.

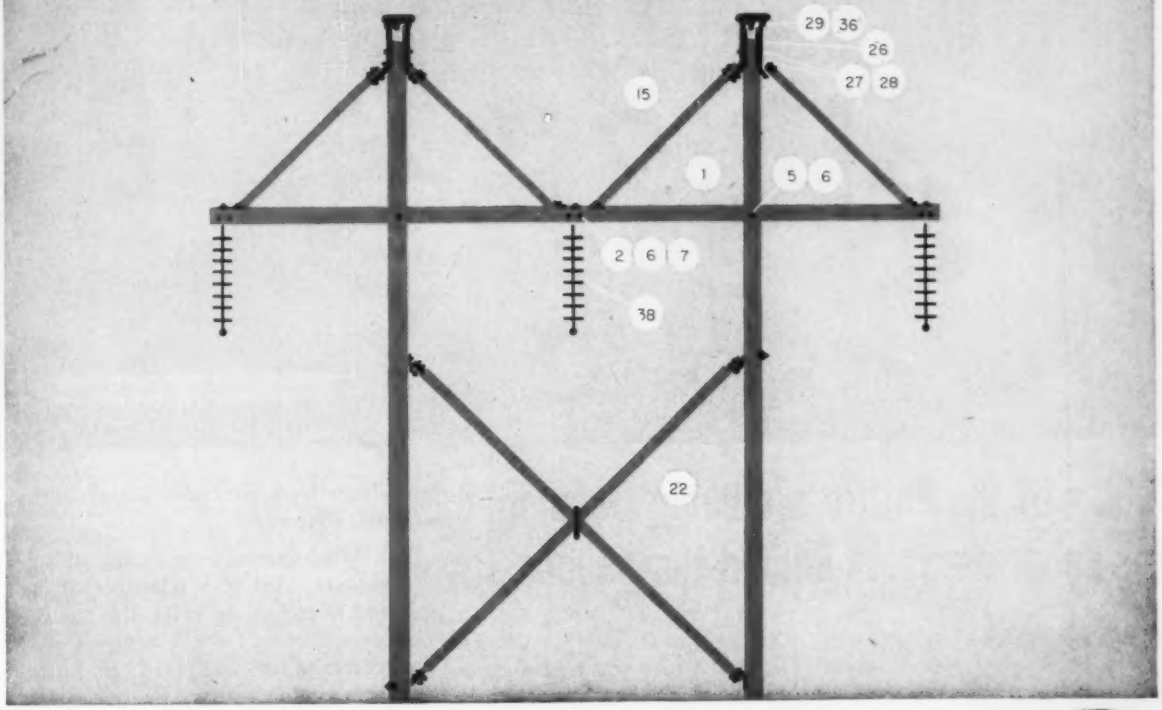
SH59-2

**SANGAMO** *Electric Company*
SPRINGFIELD, ILLINOIS

## TANGENT W/BRACES NO. 702

**H-FRAME STRUCTURE, DOUBLE PLANK CROSSARMS WITH METAL SPACERS, POLE TOP STATIC WIRE SUPPORTS, AND WOOD CROSS BRACES DESIGNED FOR 69 TO 154 KV CONSTRUCTION**

| DRG. REF. # | QUANTITY | DESCRIPTION | DRG. REF. # | QUANTITY | DESCRIPTION |
|---|---|---|---|---|---|
| 792 | 2 | Pole | 15 | 4 | Vee brace 3⅜" x 4⅜" cross section |
| 1 | 2 | Crossarm | 22 | 1 set | Cross brace w/fittings, clamp, ⅞" pole bolts and curved washers |
| 2 | 3 | Steel spacer fitting w/mounting bolts | 26 | 2 | Static wire support |
| 5 | 2 | Stud bolt ⅞" w/washer nuts | 27 | 4 | Machine bolt ¾" |
| 6 | 8 | MF locknut ⅞" | 28 | 4 | MF locknut ¾" |
| 7 | 1 | Bent stud bolt ⅞" x 8" w/2 sq. nuts | 29 | 2 | Clevis |
| 7 | 2 | Bent bolt ⅞" x 5½" w/sq. nut | 36 | 2 | Suspension clamp for static wire |
| | | | 38 | As required | Suspension insulators and fittings |




# SIMPLIFY YOUR POLE LINE PROJECTS . . .

ORDER via Graybar

The combination of top quality materials and specialized Graybar service can make a substantial contribution to simplifying your pole line projects. For example, take the structure illustrated here.

These complete cross-arm units are fabricated and fitted with hardware according to *your* specifications. Every pre-bored member fits perfectly. You reduce time consumed and cost of field assembly. You can plan on a far more smoother, efficient operation and completing the job on schedule.

Need assistance in solving tough or unusual problems? In addition to our regular service, Graybar Outside Construction specialists and field representatives are always ready to share with you their specialized knowledge.

For assistance, advice, complete quotations and the quality materials that assure uninterrupted service to your customers, make your next transmission or pole line order read "via Graybar".

761

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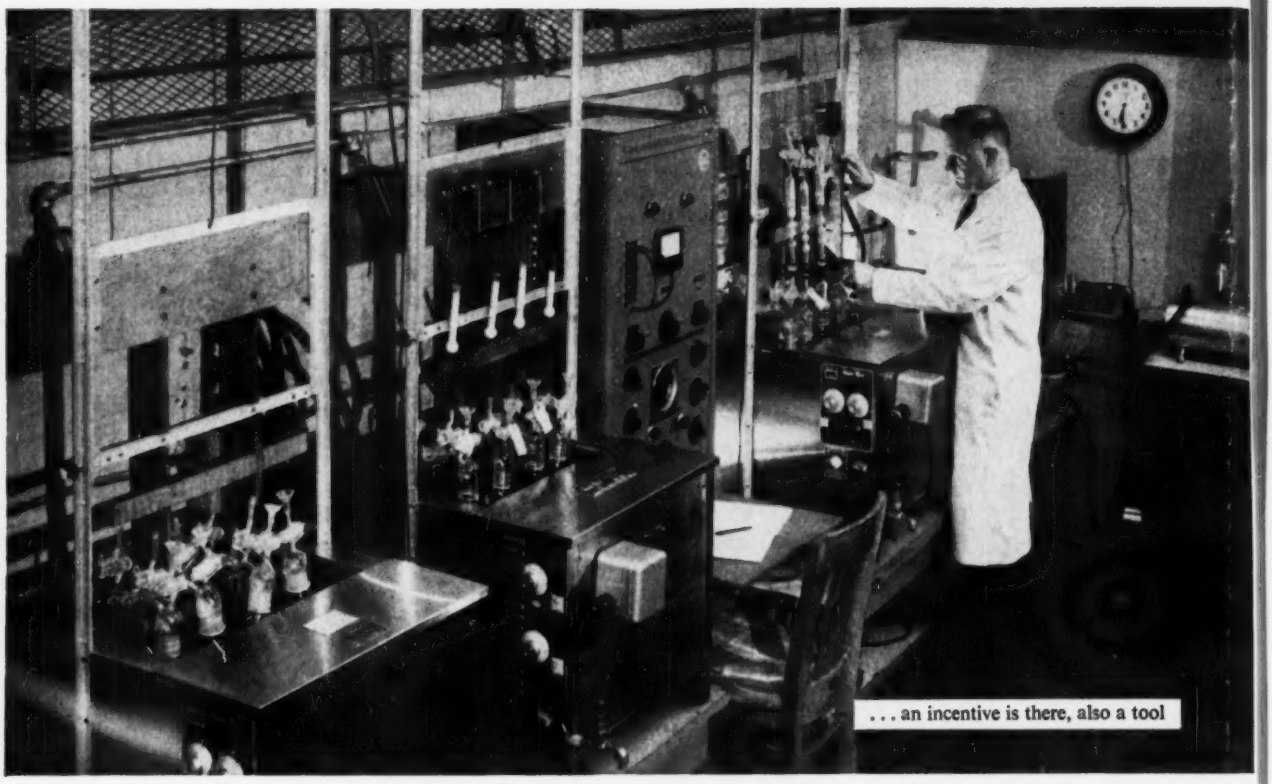


. . . an incentive is there, also a tool

# Cables of the Future are Being Developed in this Laboratory . . . a Behind-the-Scenes Story

Dr. R. B. Blodgett
Manager-Paper Cable Research

It takes constant testing and evaluation to select the best possible combination of papers and oils for use in Okonite paper cables. Okonite's Model Cable Program provides an unparalleled method for discoveries in this field. New oils, new papers, new combinations of oil and paper, new techniques and processes are but a few of the variables that the Model Cable Program enables us to evaluate in detail. Specifically, this unique research tool has three objectives:

1. **Evaluate new materials**
2. **Develop and evaluate new processes**
3. **Re-evaluate the materials and processes in current use**

The Model Cable Program has been underway at Okonite for a number of years and is an unqualified success in its own right. In addition, however, it has given our suppliers a strong incentive to cooperate with us in establishing cable materials research projects in their own laboratories. Needless to say, this has enabled us to broaden the scope of our own activity considerably.

## Here's How Okonite's Model Cable Program Works

1. The paper under consideration is wrapped on a metal tube exactly as it would be for building up a wall of insulation on an actual cable. The paper tapes are applied to the metal tube by a miniature insulating machine fitted with devices for simulating all the controls on the full size taping machines in the factory.

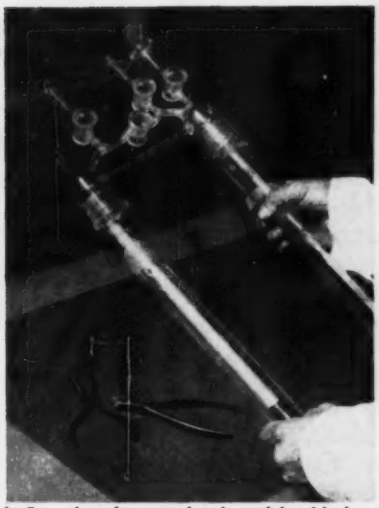
*Note:* The technician making the model cable wears clean white cotton gloves to prevent contamination of the insulating papers.

2. When finished, the model cable is vacuum dried in a miniature drying and impregnating tank. This "tank" consists of an Okonite-designed glass receptacle (or "cell" as we call them) incorporating the same design elements of the full size factory drying and impregnating tanks.

3. When the vacuum drying has been completed, the model cable is impregnated with oil. Impregnation takes place under pressure and all oil is degasified prior to its use as an impregnant. Temperature-controlled oil baths heat the oil before the impregnation cycle begins. The oils used, the temperatures, the degasification procedure, the pressures, etc., are all dependent upon the particular experiment being run.

4. After drying and impregnation, the capacity and dissipation factor of the model cable is measured at pre-determined temperatures. This is accomplished without removing the models from their "cells"; a Schering Bridge does the measuring. For some experiments, the models are age tested at

a. Making a model cable.



b. Inserting the completed model cable into the miniature drying and impregnating tank.

c. Lowering a group of miniature impregnating tanks into the heated oil bath. The tanks contain model cables.

high temperatures and voltages after which their capacities and dissipation factors are measured again.

**5.** Next, the models are subjected to voltage breakdown tests—either a-c or d-c surge. A 50kv a-c transformer or 100kv surge generator is used for voltage breakdown testing.

**6.** Finally, all data is recorded, analyzed statistically, and correlated with previous experiments.

The Model Cable Program is carried out in Okonite's Dielectrics Laboratory. In this atmosphere-controlled room a relative humidity of 25% is maintained. This enables our technicians to make direct comparisons between different experiments without concern for distortions due to environmental fluctuation. In addition, hospital cleanliness is rigidly observed in all phases of the model cable tests. This further reduces the possibility of test results being affected by unknown factors.

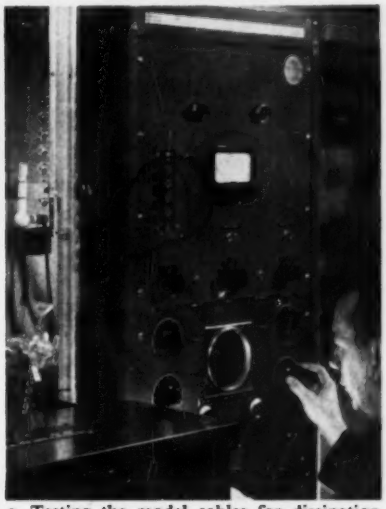
The Model Cable Program is a concrete example of the continuing, diligent effort that Okonite exerts to produce superior paper cables. It is evidence to the fact that Okonite paper cables contain *added values*, values that are not written into specifications.

Today, every good engineer I know is seeking ways to get the maximum value out of the money he invests for his company or client. The *added values* in Okonite paper cables provide an opportunity to get extra life and dependability out of electrical cable systems. As one engineer to another, I urge you to become better acquainted with this long range economy.

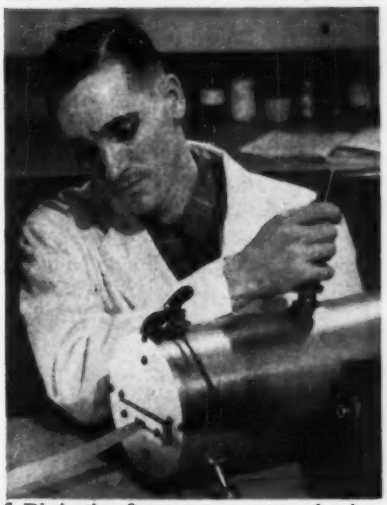
If you have not received your copy of the new Okonite paper cable catalog, or if I can be of help to you with a current problem, please get in touch with me at The Okonite Company, subsidiary of Kennecott Copper Corporation, Passaic, New Jersey.

6058-A

d. Pouring oil into the degasifying portion of the miniature impregnating tank.



e. Testing the model cables for dissipation factor and capacity . . . the Schering Bridge.



f. Dissipation factor test on a tape that has been processed together with a model cable.

*where there's electrical power... there's* **OKONITE CABLE**

6058

# Only Grinnell has a complete line of pipe

WITH 8 . . . 9 . . . even 10 inches of thermal movement not a bit unusual in today's high temperature piping systems, complete support for piping in all positions of travel is vital.

### SAFETY OF ENTIRE SYSTEM AT STAKE

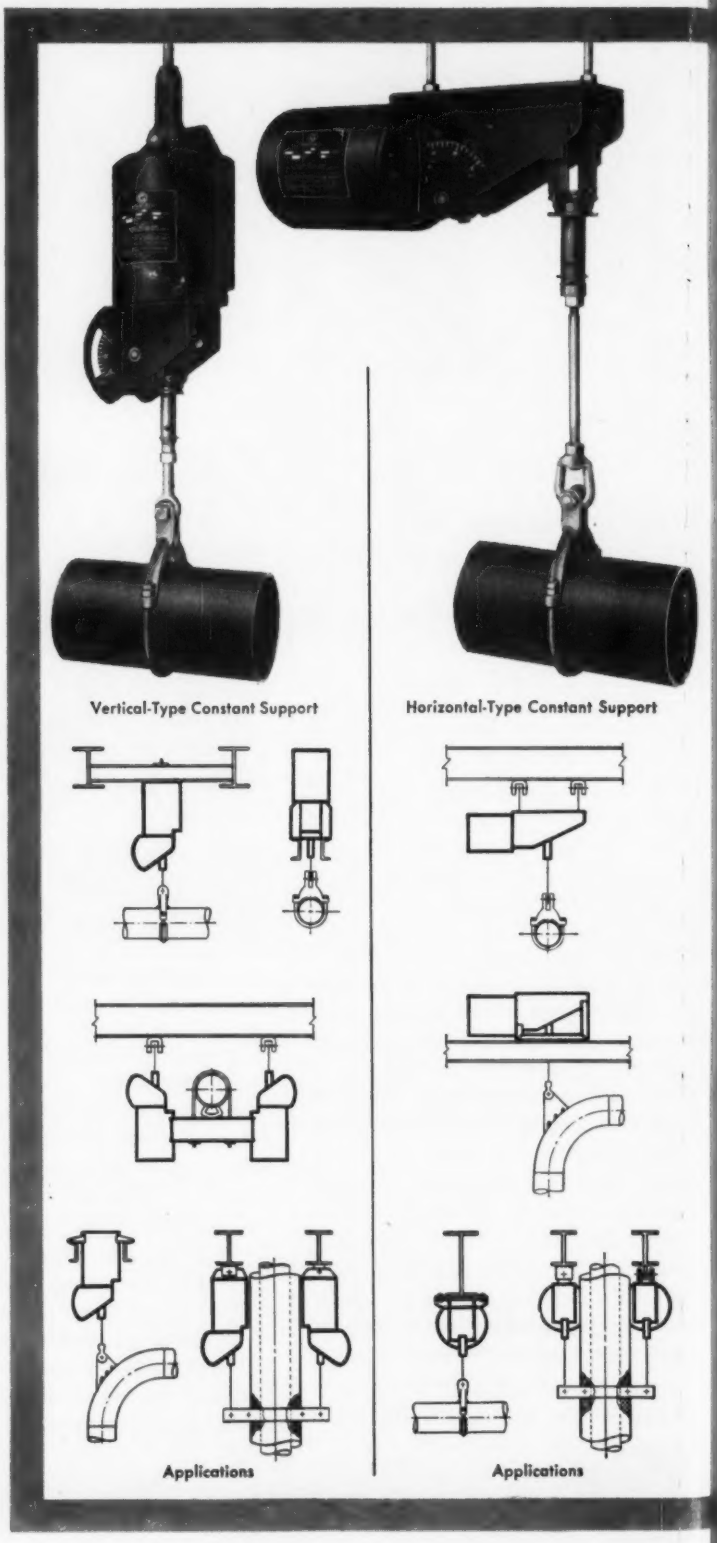
Helical coil springs are widely used to provide for thermal expansion. But the design or selection of flexible supports often is haphazard. Unless careful study is given to the design and choice of spring supports, the transfer of weight from one hanger to another, or from hanger to terminal points, can endanger the safety factor of the entire system.

### MATHEMATICALLY PERFECT GRINNELL CONSTANT SUPPORTS

Grinnell Constant Supports are the result of a century of experience in the industrial piping field. A patented geometric design, exclusive with Grinnell Constant Supports, assures mathematically perfect load support throughout all positions of travel. There is also a full 70 percentage points of adjustability built into them. No less than 10 percent of this adjustability is allowed either side of calibration for plus or minus change in load. Field readjustments are easily made by turning a single load adjustment bolt. These hangers are designed to provide uniform supporting force equal to the pipe load throughout the travel range — and should be used at selected points on critical lines, as for example at turbine connections.

#### Available in 11 Different Types

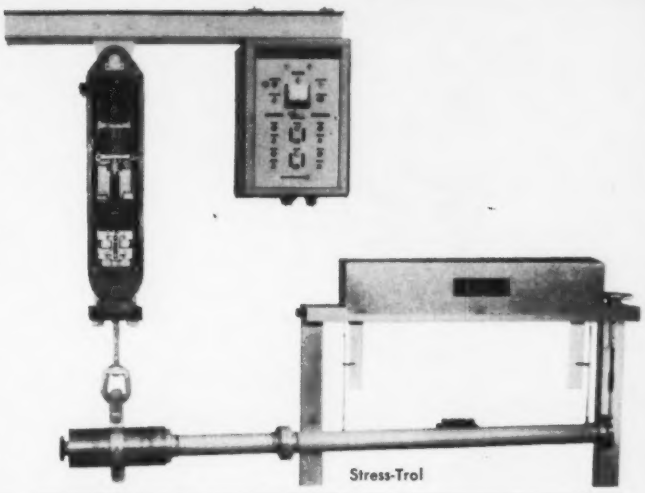
Grinnell Constant Supports are available in eleven types for a complete choice of mounting positions; above, between, or below structural steel. This choice includes both vertical and horizontal design to fit compactly into available headroom space. Even with this wide choice, Grinnell Constant Support Hangers provide mathematically perfect support through *all* ranges of travel, regardless of field adjustments.



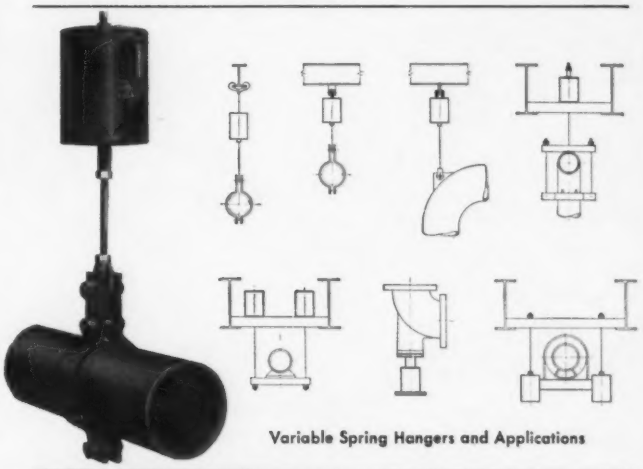

**GRINNELL**

AMERICA'S No. 1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

# hangers to provide for thermal expansion

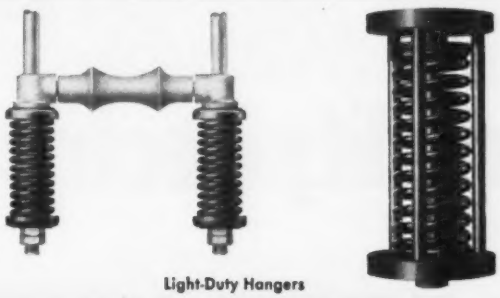


Stress-Trol



Variable Spring Hangers and Applications

Vibration Control and Sway Brace



Light-Duty Hangers

### GRINNELL STRESS-TROL* FOR POSITION AND/OR LOAD CONTROL

Keeping the footage of high pressure-high temperature fabricated piping to a minimum has become important because of high piping costs. This can be accomplished by reducing the length of long expansion bends, but providing support for shorter, less flexible lengths of piping presents a new problem. Grinnell Stress-Trol, a motor operated device, solves this problem. It provides:

**Position Control** — that minimizes stresses in piping and reactions on connected equipment.

**Load Control** — that is constant support with unlimited load and travel capacities.

### GRINNELL VARIABLE SPRING HANGERS

When pipe lines are subject to relatively small vertical movement, and do not require a constant support type hanger, Grinnell Variable Spring Hangers are available. The maximum variation in supporting force for standard spring models per ½ inch deflection is 10% of rated capacity. Grinnell offers these hangers in 21 sizes — in short, standard and double spring models, plus a special corrosion-resistant model. There are 7 different methods of attachment.

### GRINNELL VIBRATION CONTROL AND SWAY BRACE

When necessary to prevent undesirable movement in lines, Grinnell Vibration Controls and Sway Braces of the energy storing and instant-acting counter force type are recommended. They dampen vibration, oppose pipe sway and absorb shock.

### GRINNELL LIGHT-DUTY SPRING HANGERS

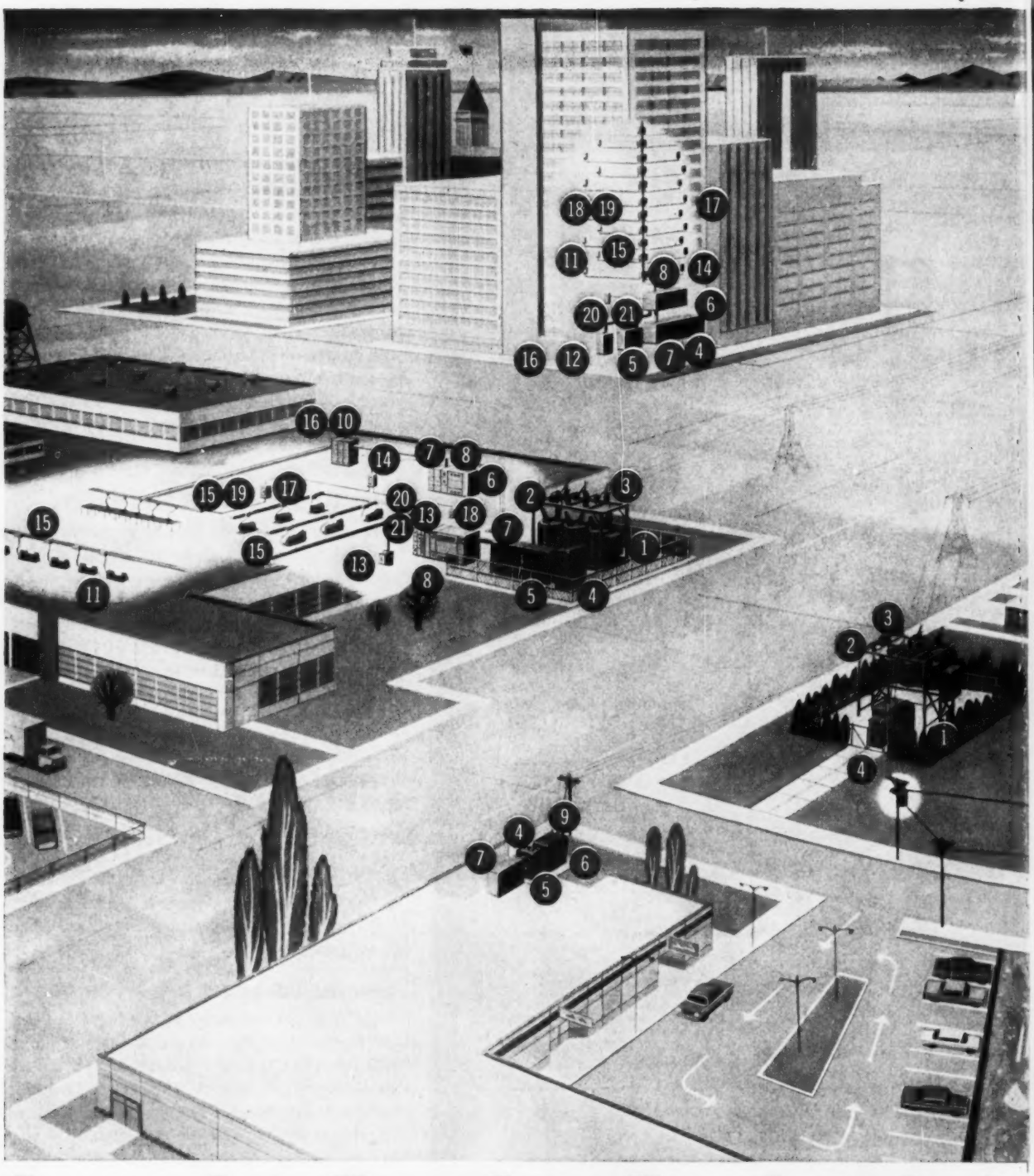
Finally, simple and inexpensive adjustable light-duty spring hangers often are all that's required to support piping safely. Grinnell has a complete line of light-duty hangers. They are designed for easy installation and quick, accurate alignment of piping.

Whatever your pipe suspension needs, Grinnell can supply them. Grinnell Company, 260 West Exchange Street, Providence 1, Rhode Island.

*Patents Applied For

**GRINNELL**

BRANCH WAREHOUSES AND DISTRIBUTORS IN PRINCIPAL CITIES

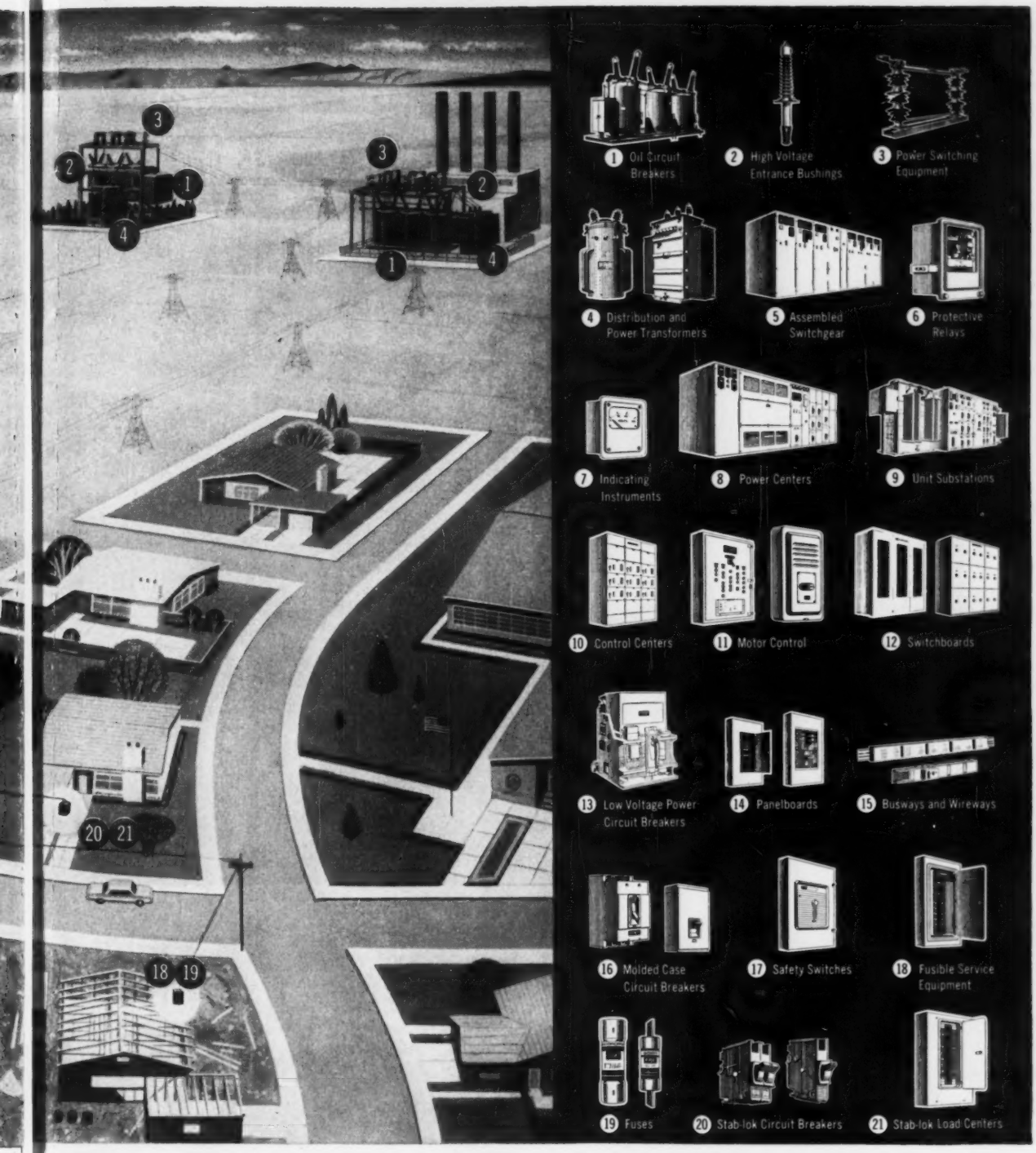


# A complete line of quality electrical

FPE

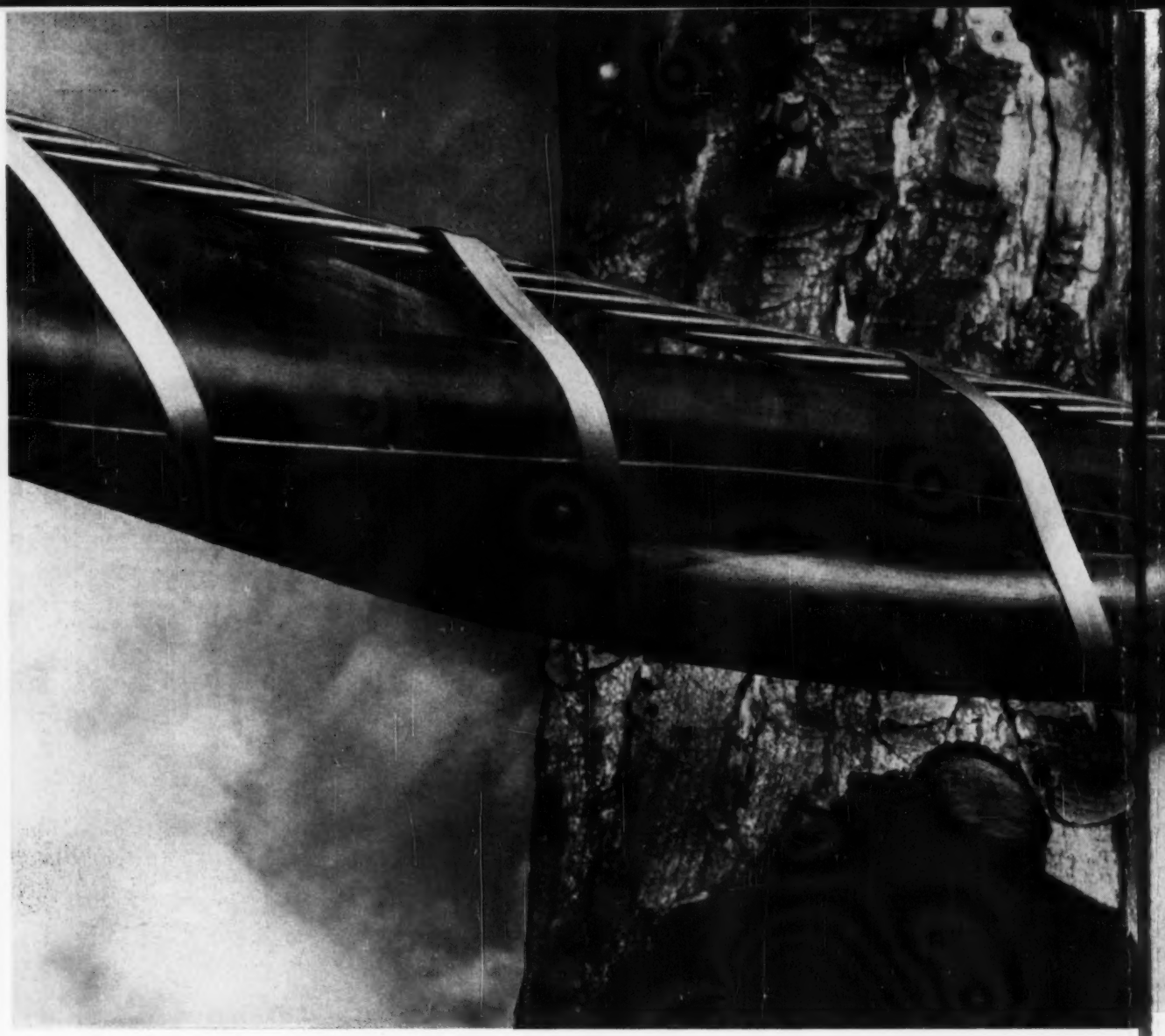
**FEDERAL PACIFIC ELECTRIC COMPANY**

General Offices: 50 Paris Street, Newark 1, New Jersey




# distribution and control equipment

**FOR HOMES, COMMERCIAL BUILDINGS, INDUSTRIAL PLANTS and UTILITY SYSTEMS**



# Blaze a smaller path!

Running a power line through a dense tree area can be a costly job!

**With open-wire systems,** the path you clear must be a broad one. Otherwise extra-long poles are necessary. Either way costs you plenty.

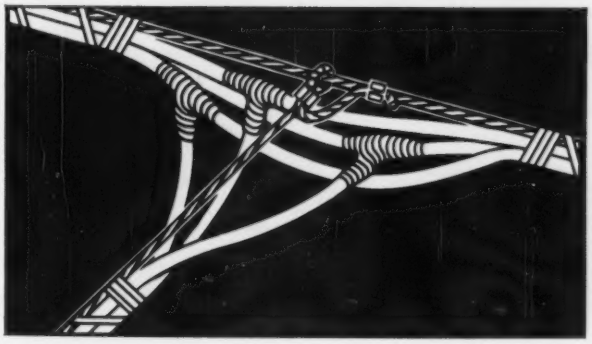
**With Rome's reverse-lay preassembled aerial power cable,** less tree clearance is required, so you do less tree trimming—initially *and* periodically. Rome aerial cable has a built-in, high-strength messenger for staunch support—capable of supporting falling branches and even trees.

For instance—you need not clear as much of a right of way *initially* as you would for open-wire systems. And you can put off *periodic* tree trimming for as long as five years, compared to the normal two-year requirement for open-wire systems.

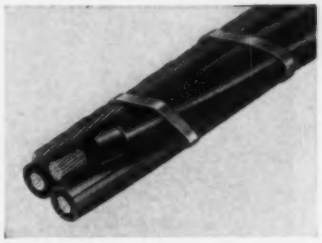
Because each conductor is fully insulated and jacketed for maximum resistance to moisture and tree abrasion, reverse-lay aerial cable reduces the chance of outages during storms and high winds. There's no chance that wet branches will cause shorting between phases. And it's safer for your line crews to handle during storms . . . safer for the public too!

In residential areas, preassembled aerial cable gives you two *more* advantages. You avoid situations in which the public might feel you are "defacing" property by excessive tree trimming. And, because it's compact, aerial cable makes a neat, uncluttered appearance—less likely to bring complaints.

You can get Rome's preassembled reverse-lay aerial power cable in a wide range of constructions, rated up to 15 KV: Rozone (oil-base) or Rozone A (butyl-base) insulation, Roprene (polychloroprene) or Roseal (flame-retardant polyethylene) jacketing. Mail the coupon, now!



**EASE OF TAPPING** Long spans sometimes make mid-span tapping necessary. Rome's reverse-lay preassembled aerial cable construction—where the direction of lay of conductors is reversed at regular intervals along the line—permits easy mid-span tapping. The reversed portions provide sufficient "slack" for taps *anywhere* along the line! This eliminates the necessity of making taps at the pole ends only. Stress is carried entirely on the messenger. Conductors can be untwisted for tapping without cutting—even while the line is hot! Your linemen can use wire guards and rubber blankets for safety and make pole-end taps without use of a platform.



**BETTER VOLTAGE REGULATION** Because of its close geometric spacing as compared with open-wire circuits, aerial cable has a lower reactance. Voltage drop is about half as great as typical crossarm construction and, for a given voltage drop, power can be transmitted twice as far.

## ROME CABLE

**Department 1-9 • Rome, New York**

☐ Please send me more information on the above.

Name .....

Title .....

Company .....

Street .....

City ..... Zone ..... State .....

**MEET THE MAN**

WHO'S DEDICATED TO **YOUR** JOB

YOUR ROME CABLE SALESMAN

When you need

# a tough fan for a tough job...

INDUSTRIAL PROCESSES

BOILER GAS RECIRCULATION

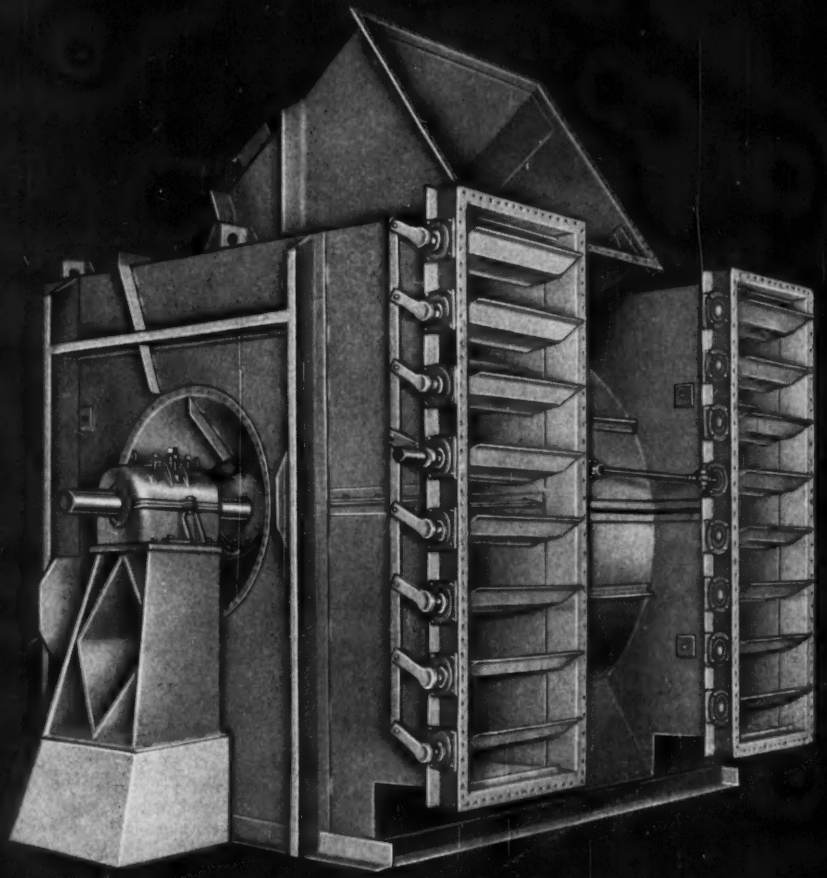
ORE SINTERING EXHAUST

ROTARY KILN EXHAUST

BLACK LIQUOR INDUCED DRAFT

WASTE HEAT INDUCED DRAFT

STEEL MILL FURNACE CIRCULATION

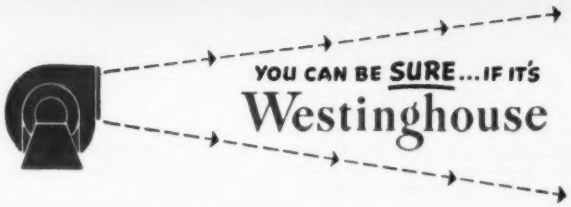


Westinghouse offers you a Heavy-Duty Fan... the right type...the right size...the right blading

**Remember this:** American Industry invests more in Westinghouse Heavy-Duty Fans than in any other.

Call your nearest Sturtevant Division Sales Engineer, or write Westinghouse Electric Corporation, Dept. J-8, Hyde Park, Boston 36, Massachusetts.

J-80662



# Look at the record

BROWN BOVERI

Year after year BROWN BOVERI has opened new vistas in extra-high voltage equipment and applications. Today BROWN BOVERI can point to 2,450,000 KVA in EHV transformer capacity delivered or on order. More than 133 air-blast circuit breakers rated 300 KV and above have been in successful operation for years both in North America and Europe.

A record of world-wide confidence in BROWN BOVERI EHV transformers and air-blast circuit breakers has been established through actual use and top performance. Maximum design voltage of most of this transmission equipment is 460 KV. Pioneering research and development of transformers and air-blast breakers rated up to 650 KV is in progress at BROWN BOVERI.

In your system planning, it may pay you to consider BROWN BOVERI'S unmatched background in the field of extra high voltage.

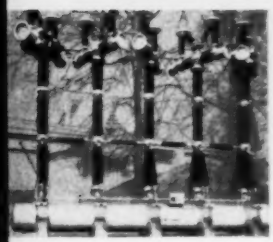
The complete record is yours for the asking.

EHV TRANSFORMERS

| Client and Shipping Date | KVA and Voltage Rating |
|---|---|
| Krangede AB Sweden 1956 | two banks 130 MVA each, 13.8/400 kV step-up generator transformers |
| Kraftwerke Hinterrhein Switzerland 1957 | two banks 400/280/187 MVA 420/201/10 kV *regulating* auto-transformers |
| RWE Germany 1958 | one bank 660 MVA, 400/230/30 kV *regulating* auto-transformers |
| EDF France 1958 | one bank 300 MVA, 380/230/10 kV |
| Imatran Voima Oy Helsinki, Finland 1960 | four single-phase three-winding auto-transformers, three-phase bank rating 420/420/55 MVA, 380/238/20 kV |

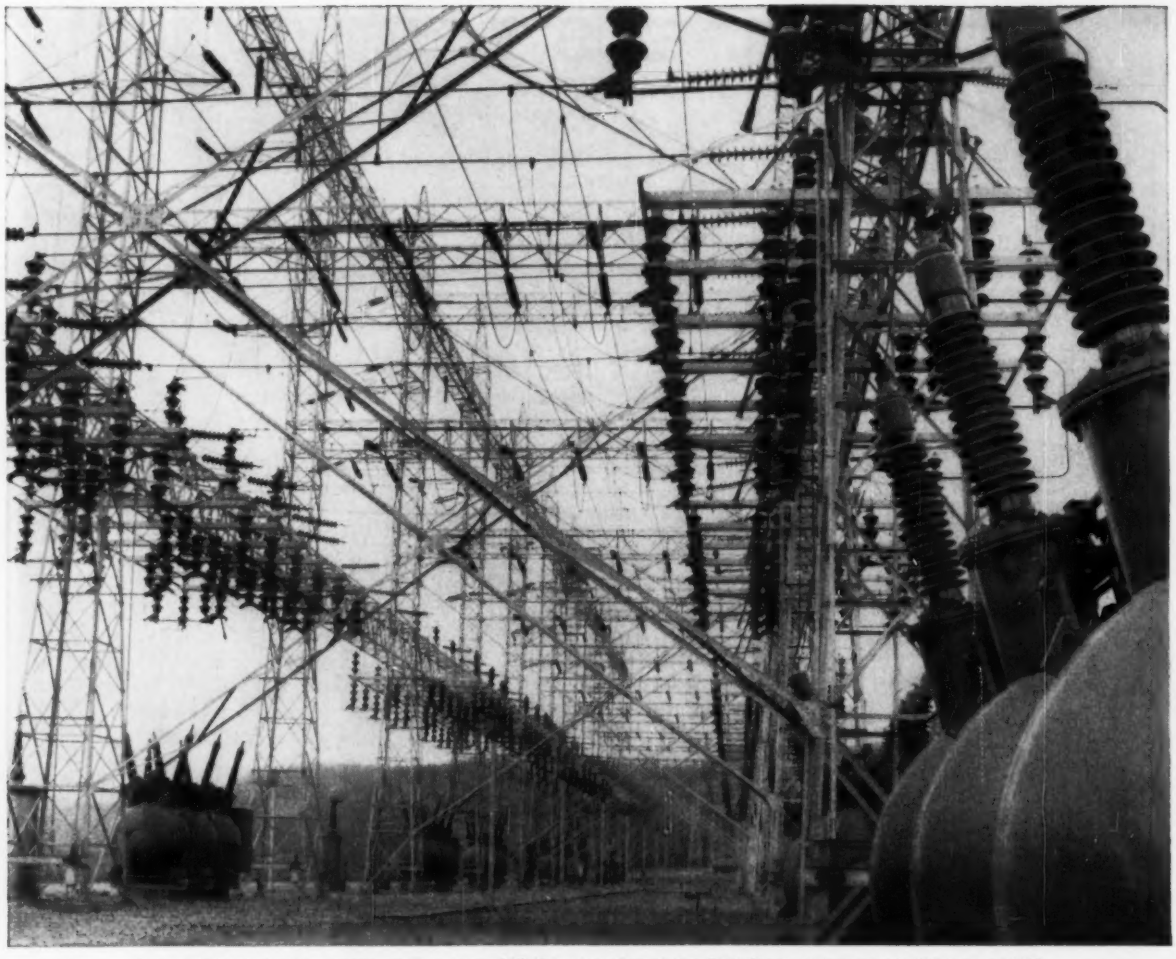
EHV AIRBLAST CIRCUIT BREAKERS

| Client and Date of Order | Quantity | MVA & Voltage Rating | |
|---|---|---|---|
| KVS Sweden 1951 | 10 | 10000 | 400 kV |
| Kamijoki Finland 1955 | 2 | 10000 | 380 kV |
| Quebec Hydro 1954 | 23 | 10000 | 300 kV |
| Imatran Voima Oy Finland 1956 | 2 | 10000 | 380 kV |
| Quebec Hydro 1956 | 39 | 10000 | 300 kV |
| Imatran Voima Oy Finland 1957 | 5 | 10000 | 300 kV |
| Imatran Voima Oy Finland 1957 | 1 | 15000 | 400 kV |
| American Electric Corp. 1957 | 2 | 25000 | 345 kV |
| RWE Germany 1957 | 2 | 15000 | 400 kV |
| Aluminium Co. Canada 1957 | 4 | 15000 | 300 kV |
| Krangede AB Sweden 1957 | 2 | 15000 | 400 kV |
| Aluminium Co. Canada 1957 | 5 | 10000 | 345 kV |
| Aluminium Co. Canada 1957 | 4 | 10000 | 345 kV |
| Aluminium Co. Canada 1957 | 5 | 10000 | 345 kV |
| Motor Columbus Switzerland 1957 | 2 | 15000 | 400 kV |
| Imatran Voima Oy Finland 1957 | 3 | 15000 | 400 kV |
| KW Vorderrhein Switzerland 1958 | 6 | 15000 | 400 kV |
| Kemiyoky Oy Finland 1958 | 1 | 15000 | 400 kV |
| Electricity Supply Commission South Africa 1959 | 16 | 15000 | 275 kV |



**BROWN BOVERI CORPORATION**

19 Rector Street, New York 6, N. Y.



**You can't beat steel for economy.** This large 345 KV substation at the Tidd Plant utilizes about 300 tons of USS Structural Steel. It is owned by Ohio Power Company and is located at Brilliant, Ohio.

# 345 KV substation built with USS Structural Steel for economy

The low cost and long life of USS galvanized Structural Steel make it the No. 1 material for substations. A large structure like this requires plenty of strength in both tension and compression — and structural steel has it.

Recently, a 230 KV substation was figured in both steel and other materials. The saving in favor of galvanized structural steel was $17,913, and the big saving was in the lower cost of steel.

*Low Maintenance Cost* Galvanized structural steel assures long-lasting and trouble-free service due to the corrosion-resisting properties of the reliable coating. Thirty years and more of unattended service has been recorded on substation structures built of this dependable product — with the plus value of neat, attractive appearance.

When you design substations in steel, you are using a proven material that will keep your costs low and give years of satisfactory service. For more information, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

*USS is a registered trademark*

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

**United States Steel**

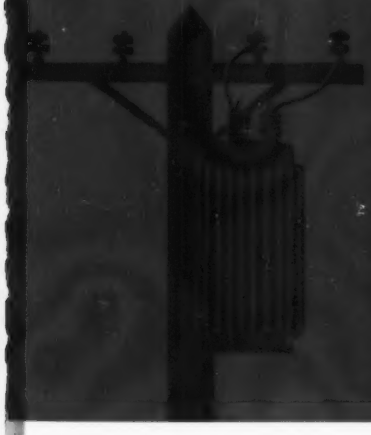
The culmination of 15 years of research on the protection of transformer tanks and covers from

# water, ice, smog, sun, salt spray and wind

NOW... Pennsylvania Transformer proudly introduces THE NEW

# V.I.P.*

FINISH for all Pole Star Distribution Transformers and Regulators



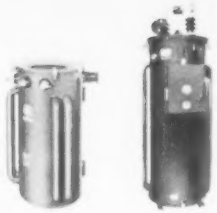
*Vinyl with Inner Phosphate

**V.I.P.** ...is not just a preparation...is not just a paint
...is an ALL NEW FINISH that will double the tank protection of your transformer IN ALL LOCATIONS

Pennsylvania POLE STAR Distribution Transformers and Regulators

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY, CANONSBURG, PA.

Turn page for V.I.P. details



## Here is what V.I.P. Finish does for your transformer and regulator tanks:

# V.I.P FINISH

**Pretreats tank surfaces to resist corrosion**
**Prevents spread of rust if scratches occur in handling**
**Provides extra high resistance to moisture, alkali, acids**
**Protects against incipient corrosion at edges, corners**
**Produces high-gloss finish that long retains its luster**

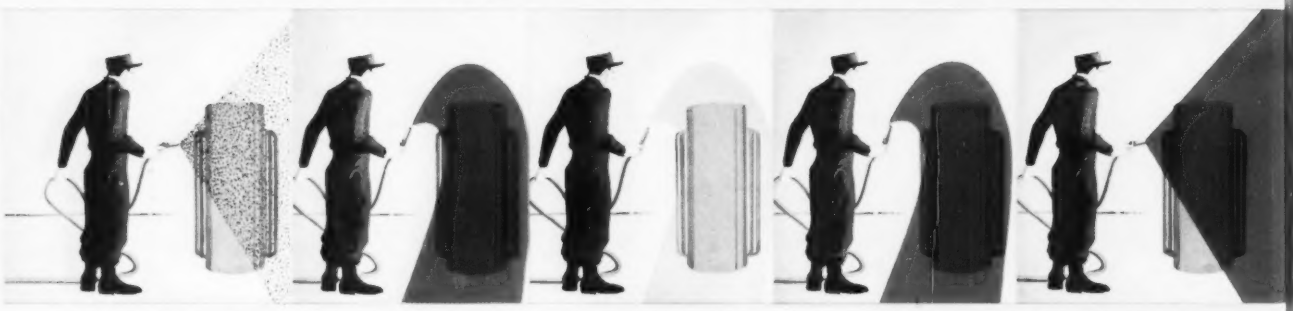
The new V.I.P. Finish for Pole Star Distribution Transformers and Regulators is *more* than a paint. Basically a *vinyl* finish with an *inner phosphate* coating, V.I.P. Finish gains its outstanding characteristics from careful preparation and pretreatment of the metal, followed by meticulously controlled application of the various coats.

A principal reason for the amazing weatherability of V.I.P. Finish is that it provides not only extra-high *primary* resistance to moisture, alkali and acids . . . but also sets up a secondary or insurance barrier that prevents the spread of corrosion if any bare metal becomes exposed, as in the case of accidental scratching. Such spots can be touched up with complete assurance that no underfilm corrosion will occur.

V.I.P. Finish is designed to save maintenance costs, even when transformers and regulators are exposed to the most highly corrosive atmospheres. Tests prove this. To take advantage of new V.I.P. Finish on your next distribution transformers or regulators, contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

McGRAW EDISON

## THIS IS THE 5-STEP V.I.P. PROCESS THAT PROVIDES ALL-WEATHER, ALL-CLIMATE PROTECTION FOR POLE STAR DISTRIBUTION TRANSFORMERS AND REGULATORS



1. In the first step, all exterior surfaces of the tank—made of copper-bearing, corrosion-resistant steel—are shot-blasted with steel grit. This removes all scale, grease and dirt, and also provides "toothage" for adhesion of the first coat to the steel surface.

2. A combination chemical pretreatment and primer applied by the flow method simultaneously form a phosphate coat and thin organic film on the clean metal. This is the V.I.P. step that prevents the spread of corrosion, even if the metal is scraped bare in spots.

3. A tough vinyl combines with non-leafing aluminum to form an almost impenetrable surface against moisture or moisture vapor.

4. An alkyd-titanium paint (used successfully on Pole Star transformers for many years) is flowed on to provide a heavy uniform coverage.

5. A final spray coat of blue-gray alkyd-titanium paint assures a smooth finish with a maximum gloss. This, together with the preceding coat, forms a hard, elastic finish that resists weathering.

**The V.I.P. Finish provides a total thickness of 3 to 4 mils for extra heavy protection. All coats are oven dried at controlled temperatures.**

### LIFE TESTS AND ACCELERATED TESTS SHOW SUPERIORITY OF NEW V.I.P. FINISH

Both transformers shown here were exposed for 2500 hours in a salt spray cabinet, then were placed outdoors in an industrial atmosphere for 2½ years. The transformer protected with V.I.P. Finish (on the right) shows hardly any effect from its ordeal, whereas the other transformer—which started with a good finish by previous standards—is badly corroded.

## Pennsylvania POLE STAR Distribution Transformers and Regulators

# The Electrical Week

**LATE NEWS** ▶ **A second "Youth Conference on the Atom"** has been scheduled for June 23-24, 1960 at the University of Michigan at Ann Arbor. The second conference will differ from the first in that it will offer a more scientifically "sophisticated" program, and will include visits to the UofM's research reactor and the Enrico Fermi A-plant.

**Soviets are designing a 6-million-kw hydro plant** to be built on the Jenessej River. Construction period is estimated at six years, the size of the turbine sets between 450-500 Mw each.

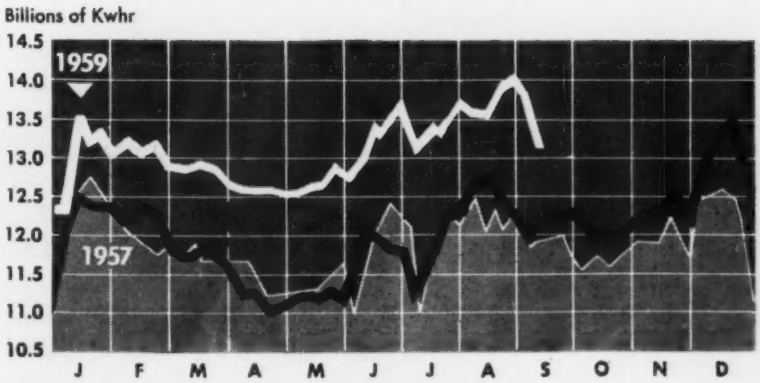
**Long Island Lighting is planning to take over Shelter Island L&P,** offering 5,400 shares of its common stock for 900 SIL&P shares.

**Kansas P&L puts in new space heating rate** for schools, businesses, and other commercial establishments approximating 1.25¢ a kwhr. A similar rate for domestic consumers has been in effect for more than a year.

**Sen Edmund Muskie (D-Me.) joins delegation of power experts** who left U.S. last week for a month-long tour of Russian hydro facilities (EW, Sept. 14, p 20). Muskie is the 11th member of the group.

**Management changes** . . . Walker L. Cisler president of Detroit Ed, is appointed a special consultant to the Department of Defense . . . GE makes five top appointments: J. H. Goss to vp and group executive for the new International Group; F. J. Borch to vp and group executive for the Consumers Products Group; C. K. Rieger to vp-Marketing Services; W. P. Von Behren to general manager of the Major Appliance Div. GE's TV and radio businesses are put into a new Radio and TV Div with Hershner Cross as general manager.

## *WEEKLY POWER OUTPUT—UP 7.0%* (Week ending Sept. 12), Kwhr 13,109,000,000




Per Cent Change From Previous Year

| | Aug. 29 | Sept. 5 | Sept. 12 |
|---|---|---|---|
| Total U. S. | +15.9 | +14.4 | + 7.0 |
| New Eng. | +10.6 | +18.2 | + 1.9 |
| Mid. Atlan. | +19.0 | +25.1 | +11.1 |
| Cent. Ind. | +16.9 | +10.9 | + 4.4 |
| West Cent. | +23.6 | +13.7 | + 5.9 |
| Southeast | +14.0 | +13.5 | + 6.6 |
| South Cent. | +13.9 | +13.8 | +10.4 |
| Rocky Mount. | + 1.8 | + 6.0 | + 2.6 |
| Pacific | | | |
| NW | +12.2 | + 7.1 | + 7.7 |
| SW | + 9.9 | +13.5 | +10.0 |

Seasonally Adjusted Index 255.3

Week Ago 264.2 Year Ago 234.8

Source: Edison Electric Institute

# Preview of this Issue

**EVENTS** ▶ **Summer peaks, bolstered by hot weather, rose 10.5%** over last summer, despite inroads of the steel strike **(p 68)** . . . A big coal pipeline that would serve four large eastern utilities is proposed by Pitt Consol. Capacity would be 10-12 million tons a year **(p 70)** . . . Containing TVA's area lends optimism to outlook of neighboring private companies **(p 71)** . . . REA Administrator Hamil admonishes co-ops' "psychology of failure" **(p 82).**

**ENGINEERING** ▶ **Primary distribution at 34.5 kv saves more than $200,000** at a new chemical plant **(p 73)** . . . A fully automated hydrox fuel cell, known as the Bacon cell, eventually may permit power stations to store off-peak power, experiment at an English laboratory indicates **(p 76)** . . . Spaced shields improve steam turbine heat rate **(p 78)** . . . A dozen key transmission trends today set the stage for a new round of standardization, a GE study shows **(p 80).**

**PROCUREMENT & PRODUCTS** ▶ **As some U. S. copper suppliers raise prices,** others hold to 30¢ a lb; dock strike expected Oct. 1 would restrict imports . . . Northern States Power leases extensive radio communications network from Motorola . . . Municipal utility purchasing officials may be asked to appear before Kefauver subcommittee, re identical bid charges **(p 99).**

# Politics and Public Power

### LOST THE WAR, BUT WON A BATTLE

Well, a tired, badly mauled, frustrated Congress finally did it: In the second round of a fight they historically should have won in the first round hands down, the Democratically controlled Senate and House of Representatives overrode an Eisenhower veto for the first time in the six and a half years of his Administration.

While there is no question that the action represents a Congressional victory, it was a small one indeed, in no way proportional to the applause and jubilation that accompanied the announcement of its results. For the public works bill—or the "pork barrel" bill, as it has come to be known—has traditionally been considered the exclusive property of Congress. It is, perhaps, the most meaningful form of local political patronage to be found on the federal scene. Indeed, only one President before Eisenhower, Grover Cleveland, has ever vetoed a public works bill. And he was so soundly thrashed that no President has tried it since.

The celebration that accompanied the vote was, in the words of one Washington commentator, ". . . a little like Floyd Patterson throwing a party because he got one glove on Ingemar Johansson, just before the lights went out!"

But while the political victory may have been small, the economic implications it carries with it in these times of near-critical inflation definitely are not.

The new law commits the government to almost $1.2 billion worth of projects. This figure includes funds not only to continue works already in progress, but also for some 67 new starts. It is almost an axiom in federal

**MANUFACTURERS** ▶ **I-T-E's new hi-voltage lab at Kelman Division** for surge tests up to 1.5 Mv is reportedly only such testing facility on West Coast . . . Square D moves headquarters from Detroit to Chicago, sets up corporate research in new facilities . . . Westinghouse and Brown-Boveri will make equipment for Seattle City Light's Canal receiving substation conversion **(p 102)**.

**NEW EQUIPMENT** ▶ **Insulation for service in contaminated, humid atmospheres** is track resistant . . . Motor starter provides short-circuit protection and coordinated control for squirrel-cage, synchronous, and wound-rotor motors up to 3,000 hp rated from 2,300 to 4,200 v **(p 110)**.

**MANAGEMENT** ▶ **Corporate profits are heading for a record high in 1959,** somewhere in the neighborhood of $50 billion dollars before taxes. The rapid rise over recession-ridden 1958 can be misleading, however. As a percentage of the sales dollar and of national income, profits still trail the post-war average; and labor wages and salaries have risen even more rapidly in the past ten years **(p 123)**.

**SELLING** ▶ **Central Maine Power uses a street lighting demonstration area** to help sell good street and highway lighting to its towns **(p 129)**.

spending that once money is spent to start a project, the subsequent funds necessary for its completion come year-by-year automatically. In the case of this new legislation, the modest amount appropriated for new starts would finally cost the government about $800 million.

This knowledge, that the first dollar spent commits the Treasury Dept to millions, was the basis of Eisenhower's objections.

It is, of course, possible that the President will kill most of these starts simply by impounding the funds for them. For while Congress can appropriate, only the President can spend.

However, it is not likely that Eisenhower will approach the new starts intending to mow them down with a fiscal scythe. Instead, look for him to use a scalpel, carefully picking and choosing the projects he wants.

Trinity is a case in point: The Administration has just about admitted defeat in its attempts to permit Pacific Gas & Electric Co to develop the river's falling water. So, it has practically acknowledged that federal funds will be necessary—and available—once construction reaches the point at which power development must start.

Also, the President can't hold out forever. There will be some slippage in favor of federal projects. But he can stem the pace, leaving a stronger bulwark for another spending-conscious Administration.

It was probably too much to hope that the Congressmen would feel the same way about it and take the long view. So while they won their first battle in a six-and-a-half-year war, the fruits of what amounts to their strictly local victories may turn out to be bitter for the country as a whole.

# Executive Reader

**Humorous approach to problems of management** is taken in a collection of cartoons and captions on various aspects of the executive's business day. The cartoons represent 85 of the most favored drawings that have appeared in "The Management Review." The 96-page book, "The Embattled Executive," marks AMA's first major effort to show the lighter side of the problems of the executive. Price $1.95 ($1.25 to AMA members). **American Management Association, New York.**

**Controlled fusion of two rare isotopes** of hydrogen may follow one of these four approaches—the Stellarator, Direct Current Experiment (DCX), Pinch Arrangement, or the Magnetic Mirror. Each method is being developed to confine the hydrogen isotope at several hundred million degrees (Kelvin) for one second or longer to make the fusion reaction a reality. **Mechanical Engineering, August, 1959.**

**Mechanically printed bills of material** prepared on standard tabulating equipment provides an avenue leading to considerable savings: Number of papers to handle 18,000 orders annually was cut by about 100,000 sheets; printing costs have been reduced; clerical requirements have been simplified or eliminated altogether; and the efficiency of stores loading increased. **Fred Warmbier, Detroit Edison Co, EEI Bulletin, July-August 1959.**

**Engineers who use the present value method** to determine the return from a proposed investment of capital should be aware of a significant fallacy in the assumptions upon which the method is based. Rate of return from the investment should be taken as the average rate at which corporate funds will be earning a return over the period of investment, and not the rate of return at which the proposed funds will be invested. **How to Assess Investment Proposals, Robert H. Baldwin, Harvard Business Review, May-June 1959.**

**Progress in radar meteorology** since the birth of this new science is presented in a new book, "Radar Meteorology", by Dr. Louis J. Battan, associate director, Institute of Atmospheric Physics, University of Arizona, and published by University of Chicago Press. The new work offers a guide to the use of radar for studying and forecasting weather. **University of Arizona, Press Bureau.**

**THIS ALL-L-M TRANSCLOSURE INSTALLATION**

**houses a Round-Wound® distribution transformer, lightning arrester, a Kyle Type NR oil switch, disconnect switch, pothead, potential transformer and secondary breakers, to supply two fully protected lighting circuits.**

**TRANSCLOSURE INSTALLATIONS will not obstruct traffic vision and can be completely hidden with shrubs. The safety and beauty of well-designed highways will not be disturbed.**

# New L-M Transclosures Save $1,750 On Each Highway Lighting Transformer Installation

## New enclosure with modular construction offers savings in cost, erection time and space; permits transformer installations at the load center.

by **C. W. PETERSEN,** Product Manager
Line Construction Materials
Line Material Industries

Costs of expressway and highway lighting can be greatly reduced by use of the new L-M Transclosure(TM) for all transformer installations. The Transclosure will house a standard oil-filled transformer, lightning arrester, oil switch, disconnect switch, pothead, secondary breakers and potential transformer. Using the Transclosure instead of the conventional concrete block or brick housing offers an estimated saving of $1,750 per transformer installation. On a projected 60 miles of highway, where 100 to 125 installations are expected, a total saving of from $175,000 to $218,000 is anticipated.

Basically the Transclosure is a weatherproof enclosure, fabricated of heavy-gauge steel, to be mounted on a concrete pad. It houses the transformer and associated equipment. It provides ample ventilation for the transformer by means of vents at top and bottom, with baffles to prohibit entrance of all foreign objects, including wildlife. Removable primary and secondary doors can be padlocked to prevent unauthorized personnel from entering, yet they provide complete and easy access to the equipment.

Interlocking design assures a weatherproof housing; the sloped roof sheds rain. Modular construction permits ganging the units to provide whatever space is required. Units may also be expanded vertically by installation of larger side panels and bottom vents. Transclosures are available in three sizes, to accommodate transformers up to 100 kva. Small in size and light in weight, they are designed to be assembled at the job site. A complete installation, including transformer and associated equipment, has been installed with less than two man-days of labor.

The clean, low lines produce a silhouette that does not detract from highway beauty or obstruct traffic vision. Low shrubs will hide the entire installation completely. Transclosures may be installed precisely at the lighting load center, eliminating all overhead construction and producing the shortest and most economical secondary runs.

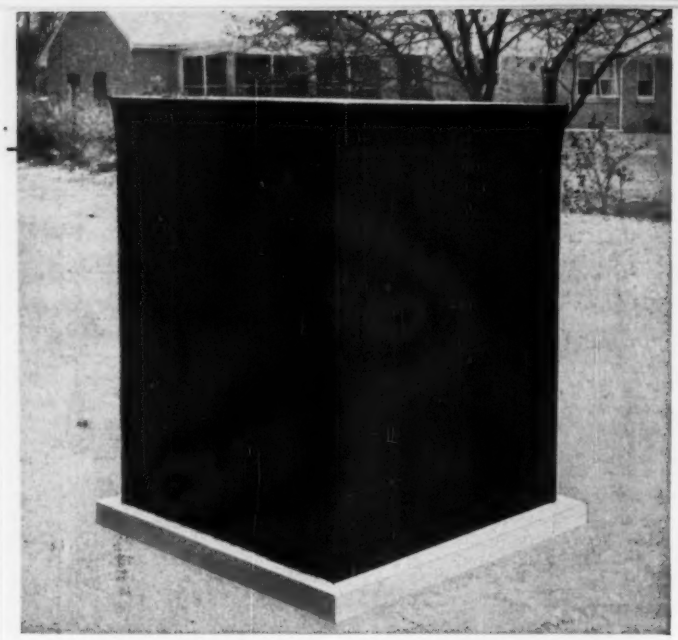
### Get Complete Information

These are just a few of the reasons why many engineers are specifying this new approach to inexpensive highway lighting. For complete details, contact your L-M Field Engineer or Lighting Engineer or write me direct at Line Material Industries, Milwaukee 1, Wisconsin. 407

**LINE MATERIAL® Industries** *Transclosures*

McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



THE L-M TRANSCLOSURE is a convenient, economical bridge between overhead and costly conventional underground. The steel enclosure houses L-M distribution transformers and protective equipment; may be ganged if desired. It is well ventilated and safe from intrusion. The unit is compact and inconspicuous, and in neighborhood service, planting conceals it completely.

THE TRANSCLOSURE, assembled at the job site, being mounted on concrete pad. Conduit and cable have already been installed. Enclosure is completely tamperproof. It is fastened to the anchor bolts on the inside. Removable front and back panels have provisions for padlocking. There is ample room for a standard pole-type transformer, cutouts, lightning arrester, pothead and other equipment.

# L-M "Transclosure" Puts Transformers Above Ground for Underground Systems

**New L-M designed enclosure provides safe, convenient installation of pole-type distribution transformers, reclosers and other protective equipment. Also convenient for load transfer control systems, and other equipment, for new subdivisions, shopping centers, industrial plants, and highway lighting.**

By **C. W. PETERSEN,**
Product Manager,
Line Construction Materials
Line Material Industries

Today every utility is faced with the problem of providing underground service safely, conveniently, and at reasonable cost. Line Material engineers have for years been familiar with the many problems of vault construction, and the type of equipment needed for conventional underground construction.

### Extremely Flexible Design

One low-cost answer to the problem is the new L-M Transclosure. The Transclosure is a heavy gauge steel cabinet, specially designed to house L-M Round-Wound pole-type distribution transformers and associated equipment. It is shipped, and stocked disassembled; assembled on the job site. Modular construction permits expanding units to provide for any desired space. The cost of intermediate side panels can be eliminated. When load growth necessitates larger transformers, units may also be expanded vertically, by installing larger side panels and bottom vents.

### Safe, Well Ventilated; Rainproof

Vents provide ample ventilation, with baffles to prevent penetration by any object. Sloped roof sheds rain. The unit is completely safe. Removable front and back doors with provisions for padlocking, provide complete and easy accessibility to equipment. With special modification meters may also be internally mounted, with glass windows in the door, for meter reading without opening the cabinet or entering the customer's premises. Telephone equipment may *also* be installed in the Transclosure in a separate compartment with separate access door.

### Three Sizes Available

The Transclosure is available in three basic sizes to accommodate a range of standard transformers. Roof, base, and door sections are identical for all three sizes and are interchangeable. With packaged "conversion" units of side panels and lower vents, a smaller unit can be changed to a larger unit.

The cost of the Transclosure is moderate—far less than conventional vault construction, and less than most of the makeshift compromises that have been tried. De-rating of L-M Transformers is not required under all except most severe overload conditions.

### Will It Meet Your Problem?

The L-M Transclosure has solved a number of different problems; there are probably many applications not yet conceived. Let us submit detailed data. Ask the L-M Field Engineer for suggestions; or write me for bulletins at Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

**LINE MATERIAL® Industries** McGRAW-EDISON

McGRAW-EDISON COMPANY

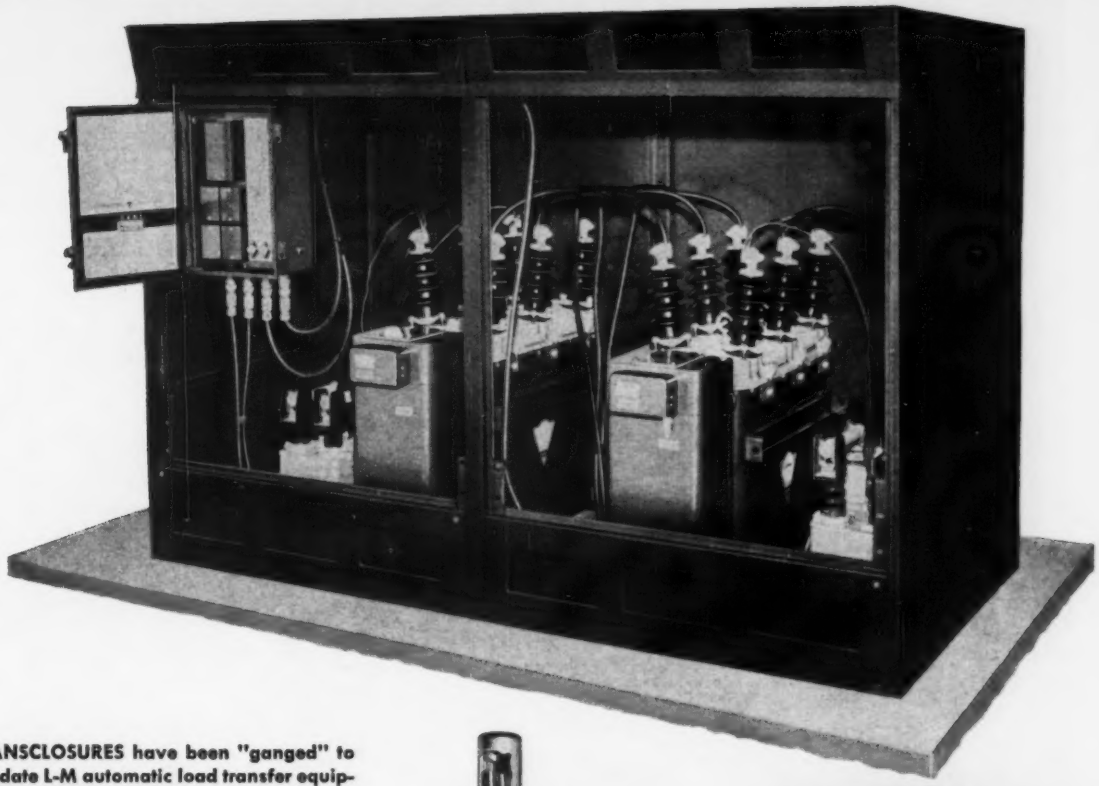
405

*Underground Distribution Equipment*

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

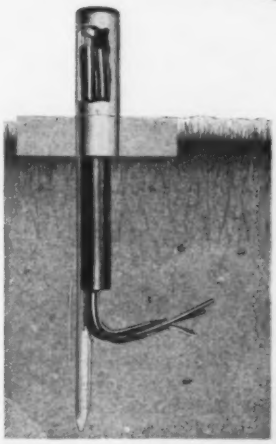
# "TRANSCLOSURE" BY L-M

## For economical underground distribution



**TWO TRANSCLOSURES have been "ganged" to accommodate L-M automatic load transfer equipment, which includes Kyle Type S control and two 400 ampere VR switches. Equipment like this is often used in radio stations, at hospitals and industrial plants and similar locations where assurance of service continuity is vital.**

**L-M POWER PEDESTAL, for use with Transclosure or Pad-Mount transformer. Provides above-ground connection for underground secondaries. A similar type is available for telephone service. Rainproof, tamperproof. Several styles and sizes. Ask for bulletin.**



### AVAILABLE IN THREE SIZES

| Catalog Numbers | DU8E1 | DU8E2 | DU8E3 |
|---|---|---|---|
| Overall Dimensions—Inches | 42 x 42 x 46 high | 42 x 42 x 56 high | 42 x 42 x 66 high |
| Max. Transformer Size | 5 KV through 25 KVA | 5 KV through 100 KVA<br>15 KV through 25 KVA | 15 KV through 100 KVA |
| Packed Ship. Wt. Ea.— | 510 pounds | 590 pounds | 645 pounds |
| Effective Venting Area (total vent less screen) | 125 Sq. in. | 250 Sq. in. | 250 Sq. in. |

**L-M's NEW**
**PAD-MOUNT TRANSFORMER**
**A specially designed unit with locked primary and secondary compartments, available in single- and three-phase types, in a variety of sizes. Provides above-ground service for underground distribution.**

The Finest Products
Made with Aluminum
are made with
REYNOLDS ALUMINUM

# NOW...
# INCREASED SAVINGS
## with Reynolds 5005* Aluminum Conductor in TRIPLEX CABLE

**Cost Per Thousand Feet For Triplex Or Other Multiplex Cables With High Strength 5005 Neutral Is Less Than Equivalent Cable With ACSR**

Initial savings are only your first benefit; consider all the others: The advantages of Triplex and other multiplex self-supporting cables over open wire installations are very well known . . . lower installation and operating costs . . . less hardware . . . neater appearance. Additional advantages are possible with Reynolds Triplex having 5005 Aluminum Alloy as the bare neutral messenger and EC aluminum as the phase conductors:

**1. Lower Costs**

The cost per thousand feet for Triplex cable with a 5005 neutral is less than that for equivalent Triplex cable with an ACSR neutral.

**2. Compared with Triplex having an ACSR neutral . . .**

Triplex with a 5005 neutral is easier to handle . . . simple to splice . . . dead-end devices develop full strength of the neutral. There is no possibility of galvanic corrosion in contaminated atmospheres.

**3. Compare with Triplex having an EC all-aluminum neutral . . .**

Triplex with a 5005 neutral has higher strength . . . spans may be lengthened . . . fewer poles are required . . . greater clearances over roads, walks and buildings are possible.

Check into the savings—in materials, time, labor and maintenance—possible with Reynolds new 5005 Aluminum Alloy as the bare neutral messenger wire in Triplex and other multiplex cables. Complete data on physical and electrical properties is available from Reynolds Distributors, the local Reynolds branch office, or write: *Reynolds Metals Company, P.O. Box 2346-EL, Richmond 18, Va.*

***5005 is a high strength all-aluminum alloy conductor developed by Reynolds. The conductivity of Reynolds 5005 has just been increased to 53.5%. This is extremely important for open wire construction – means lower power losses – improved voltage regulation – increased current carrying capacity.**

**REYNOLDS ALUMINUM**

Watch Reynolds TV shows—"ALL-STAR GOLF" and "ADVENTURES IN PARADISE"—ABC-TV

**NEOPRENE TRIPLEX WITH 5005 ALLOY NEUTRAL COMMERCIAL SIZES**

| CODE WORD | EC Phase Conductors | | | 5005 Bare Neutral Messenger | | | | Complete Cable | |
|---|---|---|---|---|---|---|---|---|---|
| | Size AWG | Stranding | Cover Thickness 64ths" | Size Circular Mil | Size EC Equiv. Size AWG | Stranding | Ult. Str. Lbs | Approx. Weight Lbs. per 1000 ft. | Diam. Inches |
| Kaki-Carp | 4 | 7 x .0772 | 4 | 48,840 | 4 | 7 x .0835 | 1421 | 220 | 0.71 |
| Kench-Shad | 2 | 7 x 0974 | 4 | 77,640 | 2 | 7 x 1053 | 2196 | 317 | 0.84 |
| Kibe-Killifish | 1/0 | 7 x 1228 | 5 | 123,550 | 1/0 | 7 x 1328 | 3444 | 506 | 1.05 |
| Kazoo-Tuna | 4 | 7 x 0772 | 4 | 30,700 | 6 | 7 x .0662 | 904 | 203 | 0.71 |
| Kaki-Shark | 2 | 7 x .0974 | 4 | 48,840 | 4 | 7 x .0835 | 1421 | 290 | 0.84 |
| Kench-Bonefish | 1/0 | 19 x .0745 | 5 | 77,640 | 2 | 7 x 1053 | 2196 | 450 | 1.06 |

**POLYETHYLENE TRIPLEX WITH 5005 ALLOY NEUTRAL COMMERCIAL SIZES**

| CODE WORD | EC Phase Conductors | | | 5005 Bare Neutral Messenger | | | | Complete Cable | |
|---|---|---|---|---|---|---|---|---|---|
| | Size AWG | Stranding | Cover Thickness 64ths" | Size Circular Mil | Size EC Equiv. Size AWG | Stranding | Ult. Str. Lbs. | Approx. Weight Lbs. per 1000 ft. | Diam. Inches |
| Kaki-Periwinkle | 4 | 7 x 0772 | 3 | 48,840 | 4 | 7 x .0835 | 1421 | 165 | 0.65 |
| Kench-Conch | 2 | 7 x 0974 | 3 | 77,640 | 2 | 7 x 1053 | 2196 | 252 | 0.77 |
| Kibe-Neritina | 1/0 | 7 x 1228 | 4 | 123,550 | 1/0 | 7 x 1328 | 3444 | 412 | 0.99 |
| Kazoo-Strombus | 4 | 7 x .0772 | 3 | 30,700 | 6 | 7 x .0662 | 904 | 149 | 0.65 |
| Kaki-Cockle | 2 | 7 x .0974 | 3 | 48,840 | 4 | 7 x .0835 | 1421 | 224 | 0.77 |
| Kaki-Gebia | 2 | 7 x 0974 | 4 | 48,840 | 4 | 7 x .0835 | 1421 | 240 | 0.83 |
| Kench-Janthina | 1/0 | 7 x .1228 | 4 | 77,640 | 2 | 7 x .1053 | 2196 | 369 | 0.99 |

NOTE: These are representative sizes: for complete information on all available sizes call your nearest Reynolds office or write Reynolds Metals Co. (P. O. Box 2346-EL) Richmond 18, Virginia

# What's the latest in

## C-E BOILERS * FOR HIGHEST STEAM PRESSURES

| COMPANY | STATION | No. of Units | Throttle Pressure | Steam Temperature | Capacity—kw Total |
|---|---|---|---|---|---|
| | | **FOR SUPERCRITICAL PRESSURES** | | | |
| Philadelphia Electric Co. | Eddystone | 1 | 5000 | 1200/1050/1050 | 325,000 |
| Philadelphia Electric Co. | Eddystone | 1 | 3500 | 1050/1050/1050 | 325,000 |
| Cleveland Electric Illuminating Co. | Avon | 1 | 3500 | 1100/1050 | 215,000 |
| | | **FOR SUBCRITICAL PRESSURES — ABOVE 2400-LB** | | | |
| Metropolitan Edison Co. | Portland | 1 | 2520 | 1050/1050 | 165,000 |
| Metropolitan Edison Co. | Portland | 1 | 2520 | 1050/1000 | 225,000 |
| New England Power Co. | Brayton | 1 | 2520 | 1000/1000 | 250,000 |
| Virginia Electric & Power Co. | Chesterfield | 1 | 2520 | 1000/1000 | 167,000 |
| Virginia Electric & Power Co. | Possum Point | 1 | 2520 | 1000/1000 | 225,000 |
| Dayton Power & Light Co. | Tait | 2 | 2490 | 1050/1000 | 260,000 |
| | | **FOR SUBCRITICAL PRESSURE—2400-LB** | | | |
| Central Hudson Gas & Electric Co. | Danskammer | 1 | 2400 | 1050/1000 | 125,000 |
| Cincinnati Gas & Electric Co. | Beckjord | 1 | 2400 | 1050/1000 | 156,250 |
| Cincinnati Gas & Electric Co. | Miami Fort | 1 | 2400 | 1050/1000 | 156,250 |
| Cleveland Electric Illuminating Co. | Ashtabula | 1 | 2400 | 1050/1050 | 225,000 |
| Cleveland Electric Illuminating Co. | Eastlake | 1 | 2400 | 1050/1050 | 187,500 |
| Cleveland Electric Illuminating Co. | Lakeshore | 1 | 2400 | 1010/1010 | 225,000 |
| Consumers Power Co. | Karn | 1 | 2400 | 1050/1050 | 250,000 |
| Consumers Power Co. | Port Sheldon | 1 | 2400 | 1050/1000 | 250,000 |
| Detroit Edison Co. | St. Clair | 1 | 2400 | 1050/1000 | 325,000 |
| Duke Power Co. | Allen | 2 | 2400 | 1050/1000 | 330,000 |
| Duke Power Co. | Allen | 3 | 2400 | 1050/1000 | 825,000 |
| Duke Power Co. | Lee | 1 | 2400 | 1050/1000 | 165,000 |
| Niagara Mohawk Power Co. | Dunkirk | 2 | 2400 | 1050/1000 | 400,000 |
| Niagara Mohawk Power Co. | Huntley | 2 | 2400 | 1050/1000 | 400,000 |
| Pennsylvania Electric Co. | Shawville | 2 | 2400 | 1050/1000 | 330,000 |
| Pennsylvania Power & Light Co. | Brunner Island | 1 | 2400 | 1000/1000 | 300,000 |
| Philadelphia Electric Co. | Schuylkill | 1 | 2400 | 1050/1000 | 175,000 |
| Potomac Electric Co. | Dickerson | 2 | 2400 | 1050/1000 | 350,000 |
| South Carolina Electric & Gas Co. | McMeekin | 3 | 2400 | 1050/1000 | 375,000 |
| Tennessee Valley Authority | Widows Creek | 1 | 2400 | 1050/1000 | 500,000 |

* The above list covers American utilities only. Abroad, too, the C-E Controlled Circulation Boiler has achieved a predominant position for 2400-lb applications, evidenced by orders placed with C-E or its licensees for 23 units with an aggregate capacity of 5,030,750 kw.

# COMBUSTION

**Combustion Engineering Building**

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS;

# Steam Pressures?

Although one unit for supercritical pressure is presently in service and others soon will be, today's pressure plateau is in the 2400-2520 psi range.

It appears inevitable that many new units will be purchased for this pressure cycle, since it offers a heat rate gain of about 185 Btu over the 1800-psi pressure class. With ever-increasing fuel prices, there is ample incentive to move up to these higher pressures.

In the entire area of high pressures, temperatures and capacities, Combustion is playing a leading role. As indicated by the list on the opposite page, 39 C-E units have been purchased for use in the 2400-lb. pressure range and above—33 of the Controlled Circulation design. The turbine-generator capacity for the 39 units listed totals over 8-million kilowatts. Already, 16 of these units are in service supplying steam to produce more than 2½-million kw. One has been in service over 3 years.

Later this year, a C-E Sulzer Monotube unit, designed for the highest steam pressure and temperature to date (5000 psi at 1200 F), is scheduled to go into service at the Eddystone Station of Philadelphia Electric Company. Two more supercritical pressure units, for 3500 psi, are now under construction. Similar units for subcritical pressure are already in service for Metropolitan Edison Co. and Dayton Power & Light Co.

Along with higher pressure, the trend is toward higher unit capacities. In another year, the average size of high pressure units purchased should be up to 250 megawatts as compared to an average of 200 mw, for the units listed on the opposite page.

**ENGINEERING**

**200 Madison Avenue, New York 16, N. Y.**

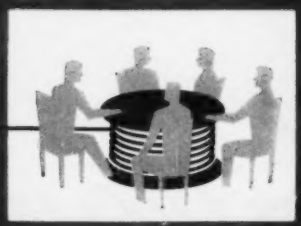
C-E

C-218A

**PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE**

DU PONT

# WIRE AND CABLE ROUND TABLE



# We don't make wire and cable, but...

. . . we have a vital interest in the industry for two reasons: (1) Du Pont produces materials for wire and cable insulation and jackets, and (2) we also use miles and miles of finished cable in our own plants and buildings.

What does this mean to you? It means we're concerned with improving products from the standpoint of the raw-material supplier and *user*.

In our labs, there is constant study of plastic materials and their properties. And many times our engineers are called into the field to help solve specific problems and to suggest where a thermoplastic resin might do the job better. With the data gained from this laboratory and field work, we design and install cable in our own plants for service experience.

If you would like to know more about Du Pont's experience as a wire and cable user, write Room 179A, Advertising Department, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

For advice on the design of your specific cable, consult your wire and cable supplier.

POLYCHEMICALS DEPARTMENT

DU PONT

REG. U.S. PAT. OFF.

Better Things for Better Living . . . *through Chemistry*

**ALATHON®** POLYETHYLENE RESINS | **RULAN®** FLAME-RETARDANT PLASTICS | **ZYTEL®** NYLON RESINS

This provides a completely sealed construction at this point. Each terminal is equipped with a clamp-type connector to take leads up to No. 6 AWG. ●

connectors of the two-bolt construction to take No. 2 AWG to 300 MCM cable. This makes a tight, low-resistance connection to the line conductor. ●

For d-c currents over 10,000 amperes, remote indication accurate to 1.0 per cent can be obtained with a totalizing d-c current transformer system.

# New Electric Utility Study Could Herald Advent of Standardization on 200-amp Capacity Meters

## TEST RESULTS FROM 21 ELECTRIC UTILITIES PROVE CLASS 200 METERS EQUAL PERFORMANCE OF CLASS 60 AND 100's AT ALL LOADS

**SOMERSWORTH, N. H.**—One of the most important questions currently facing electric utilities was answered today when the General Electric Company released results of a nation-wide, in-series test comparison of Class 200 versus Classes 60 and 100 watthour meters.

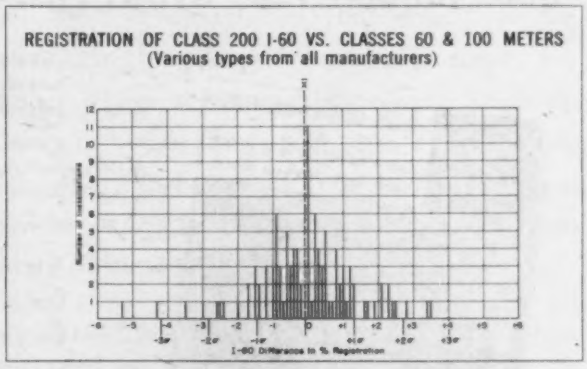
Conducted by 21 utilities at the invitation of General Electric's Meter Department, the tests showed conclusively that Class 200 meters—such as G.E.'s I-60—can equal or better the performance of any existing single-phase meter at all loads up to 200 amperes.

At each of 114 residential test sites, a Class 200 meter was mounted on the line side of, and in series with, either a Class 60 or a Class 100 meter. Meters of four manufacturers were used in the tests which extended over periods ranging from seven days to ten months.

On the strength of this series comparison test study, more electric utilities could decide to standardize on Class 200 metering to simplify purchasing routines and reduce meter inventories.

Data contained in this series comparison test report can also be utilized to compare the performance of competitive Classes 60, 100 and 200 meters. Complete copies of the study can be obtained from G.E. by filling out and returning the coupon on the next page.

In comparison tests, the Class 200 meter was placed on the line side in series with the billing meter. Meters were 3-wire, 240-volt.


REGISTRATION OF CLASS 200 I-60 VS. CLASSES 60 & 100 METERS
(Various types from all manufacturers)
Number of Installations
I-60 Difference in % Registration

Typical series test chart from G.E.'s report compares performance of G.E.'s Class 200 meter versus 114 Classes 60 and 100 billing meters.

PLEASE TURN PAGE

GENERAL ELECTRIC

ACCURACY (Testing)

the windings and from the windings to the core and other grounded structure consists of compound cylinders, kraft pressboard collars, and barriers. ●

since this d-c counterpart of the conventional a-c current transformer is of a window-type design which slips over the d-c bus or cable.

tached, thus preventing any shifting of parts during transportation and installation. The entire core and coil structure is suspended from the tank cover. ●

# Electric Utility Comparison Tests Prove General Electric I-60 Watthour Meters Outperform Competitive Class 200 Meters

**SOMERSWORTH, N. H.**—One fact stood out clearly today as results of a nation-wide, in-series test comparison of Class 200 versus Classes 60 and 100 watthour meters were announced. It was that General Electric's Class 200 I-60 single-phase meter's performance is "significantly better" than that of competitive Class 200 meters.

The tests—conducted by more than a score of electric utility companies—consisted of individual residential applications of a Class 200 meter mounted in series with a Class 60 or Class 100 billing meter. Comparison test results from each utility were forwarded to General Electric where they were compiled, categorized and factored into an overall report. The combined results are sufficiently large to permit fair comparisons and unbiased conclusions.

Meters of four manufacturers were used in the series comparisons, and test periods extended from seven days to ten months. In summary, here's how the four Class 200 meters performed:

| PERCENT DIFFERENCE IN CLASS 200 METER REGISTRATION | |
|---|---|
| G.E. | −.28% |
| MFR. A | −.72% |
| MFR. B | −1.18% |
| MFR. C | −.55% |

Electric utility comparison test results show General Electric's I-60 is today's best-performing Class 200 meter.

The superior performance of General Electric's I-60 meter is attributable in large part to its unequalled "on-line" accuracy at all loads—from the smallest lighting loads to heavy house-heating and air-conditioning loads. In addition, the I-60 features G.E.'s unique magnetic suspension—a truly lifetime bearing system. More than 10,000,000 General Electric meters with magnetic suspensions are in service today, without a single failure of the "floating disk" being reported.

Copies of the complete series comparison test report are available now from General Electric. To obtain your copy, fill out and return the coupon below.

*Cut along dotted line*

## FOR FREE COPY OF COMPLETE, TWO-YEAR ELECTRIC UTILITY COMPARISON TEST-STUDY FILL OUT AND RETURN THIS COUPON

General Electric Company
Section 628-30
Schenectady 5, New York

Please send me a copy of bulletin GET-3025, "Series Comparison Tests of Classes 60 and 100 versus Class 200 Single Stator Watthour Meters."

Name_____

Title_____

Company_____

Street_____ City_____

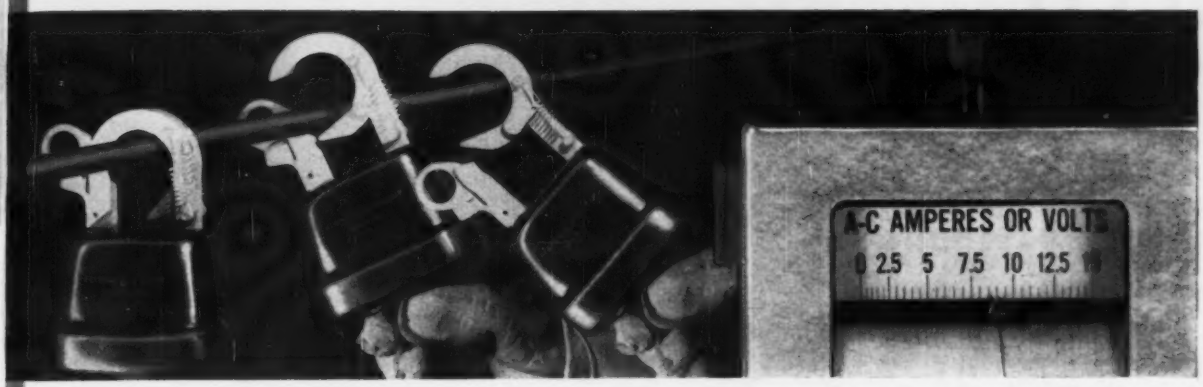
State_____

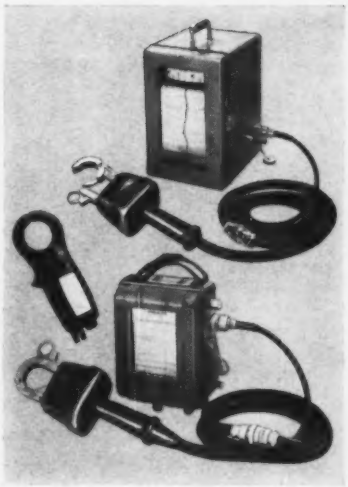
*Progress Is Our Most Important Product*

GENERAL ELECTRIC

LIFE BACKGROUND

# *hooks on, records dips, peaks . . .*



***This new General Electric Type CH-7 "hook on"*** continuously records all transient dips and peaks up to 750 amps or volts without breaking the circuit. It's portable, inking . . . features throw-away inkwell, 0.7 second response time and 28 chart speeds. ***No power required . . .*** unattended, it operates 60 days indoors or outdoors from a hand-wound, spring-clock chart drive. And the butyl-molded hook-on transformer is now available in ***new 13.2 and standard 8.7 kv-rated insulation.*** Companion portable and switchboard models in the CH inking line record a-c and d-c volts and amps, a-c watts, vars, frequency, and d-c milliamps and millivolts. Or, for an inkless trace, General Electric's ***all-weather*** Type CF-7 portable recorder offers the same hook-on convenience. Indicating Type AK instruments, with trigger-operated hook, give ***quick, accurate readings.*** Range selector rotates with finger-tip pressure . . . only one scale shows at a time. For the complete "hook-on" story just contact your nearby G-E Apparatus Sales Office or Distributor; or write direct to Section 592-103, General Electric Co., Schenectady 5, N. Y.

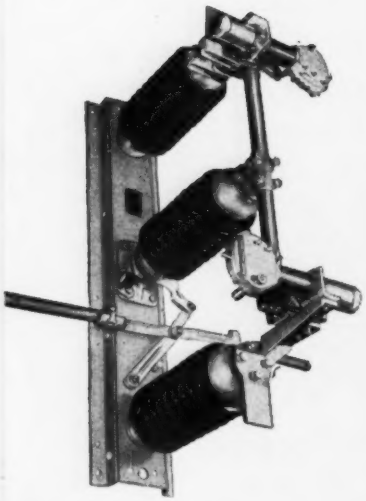
***Other General Electric Instruments for Electric Utilities***—*High-accuracy portable, panel and switchboard indicating instruments; recorders, indicator and recorder controllers; halogen leak detectors.*

INSTRUMENT DEPARTMENT

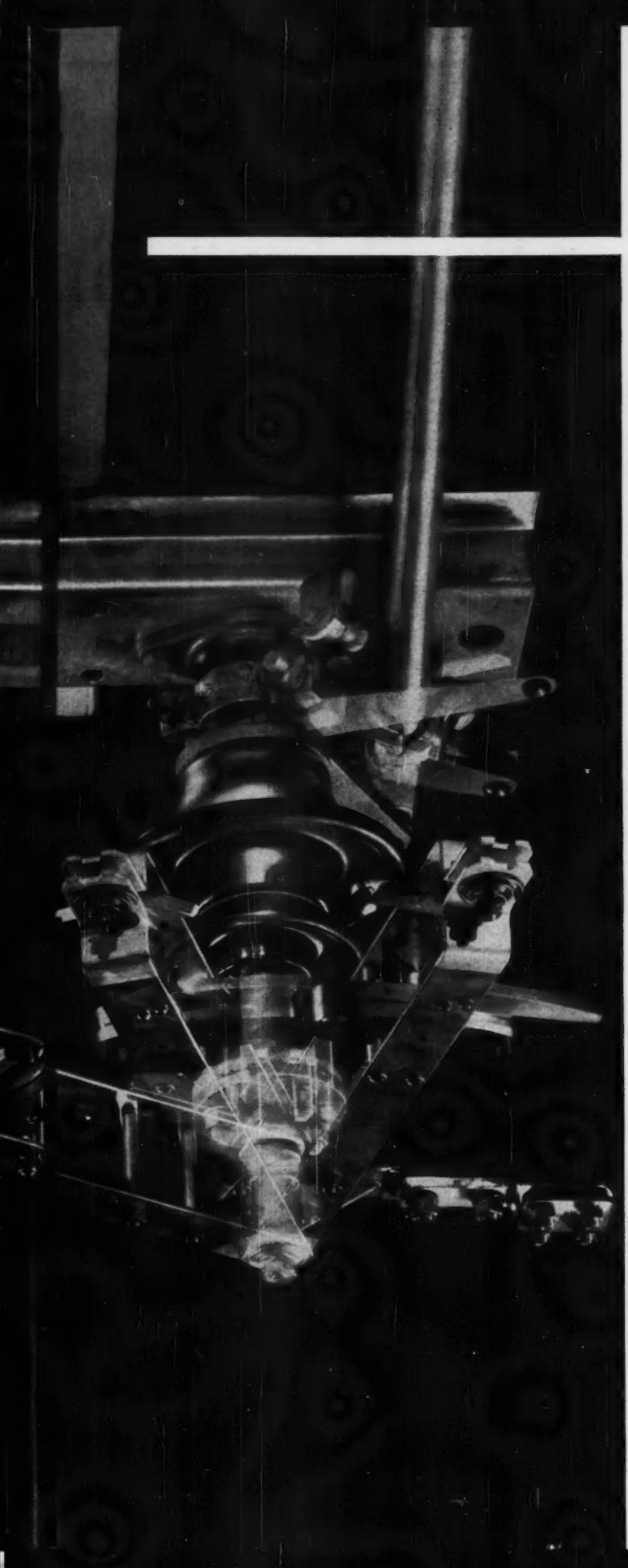
GENERAL ELECTRIC

# SPLIT THE LOAD

## (OR EVEN DUMP IT)



Double-Break Style, 34.5 kv rating (above) and Side-Break Style, 14.4 kv rating (right)



# with S&C Load Interrupters that cost no more than disconnects

Now from S&C you can get load interrupters at the same price as disconnects. This means that you can handle any kind of line switching in the simplest way at the lowest possible cost.

Here are the devices that do it:

1. The Side-Break Alduti Load Interrupter at 7.2 kv and 14.4 kv, and
2. The Double-Break Alduti Load Interrupter at 23 kv and 34.5 kv.

Both give you load dumping* (full 600-ampere arc-free load switching at full line voltage) along with loop sectionalizing (switching currents in parallel or loop circuits) and line dropping (switching line charging currents).

Since these switching duties at today's voltages and loads can't be handled by disconnects, why not compare the cost of S&C Load Interrupters with disconnects. You'll find there's no premium price for premium performance.

Here are some of the other advantages of S&C Load Interrupters:

- 600-amp load switching without line or feeder breaker openings
- a maintenance-free interrupting device
- no external arc
- can be mounted in any position . . . vertical, upright or inverted.

For more information, please contact S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Ill.

* Important because: (1) Emergency situations (wires down, etc.) demand quick action, hence dumping the load. There is no time to set up communications for complicated breaker and switch sequencing. And (2) there's always the possibility of an operator error or misunderstanding, with the result that a loaded circuit may be dumped inadvertently.

**S&C ELECTRIC COMPANY**

S&C

# Your new power plant or expansion idea

**Location correct?**

**Capacity adequate?**

**Readily financed?**

**Timely?**

Kaiser Engineers designs and builds a wide variety of power plants and nuclear facilities.

Among KE's most valued services are sound, searching economic analyses, feasibility studies and site evaluations. In a word—*Pre-Engineering*—impartial, outside analysis which helps you decide whether to proceed with, defer or modify the project.

Kaiser Engineers offers you cost-saving, time-saving, one-company service from concept through start-up.

## KAISER ENGINEERS

Division of Henry J. Kaiser Company
Oakland 12, California
Pittsburgh, Washington, D. C., Chicago, New York

• KE projects include work in Ghana, Japan, Puerto Rico, Vietnam, as well as the United States. They encompass such diverse assignments as nuclear fuel analysis, a nuclear research center, plutonium production reactor, steam-electric power station and a hydro-electric plant.

5459-P

Change hats
with your maintenance man . . .

You'll find out, with . . .

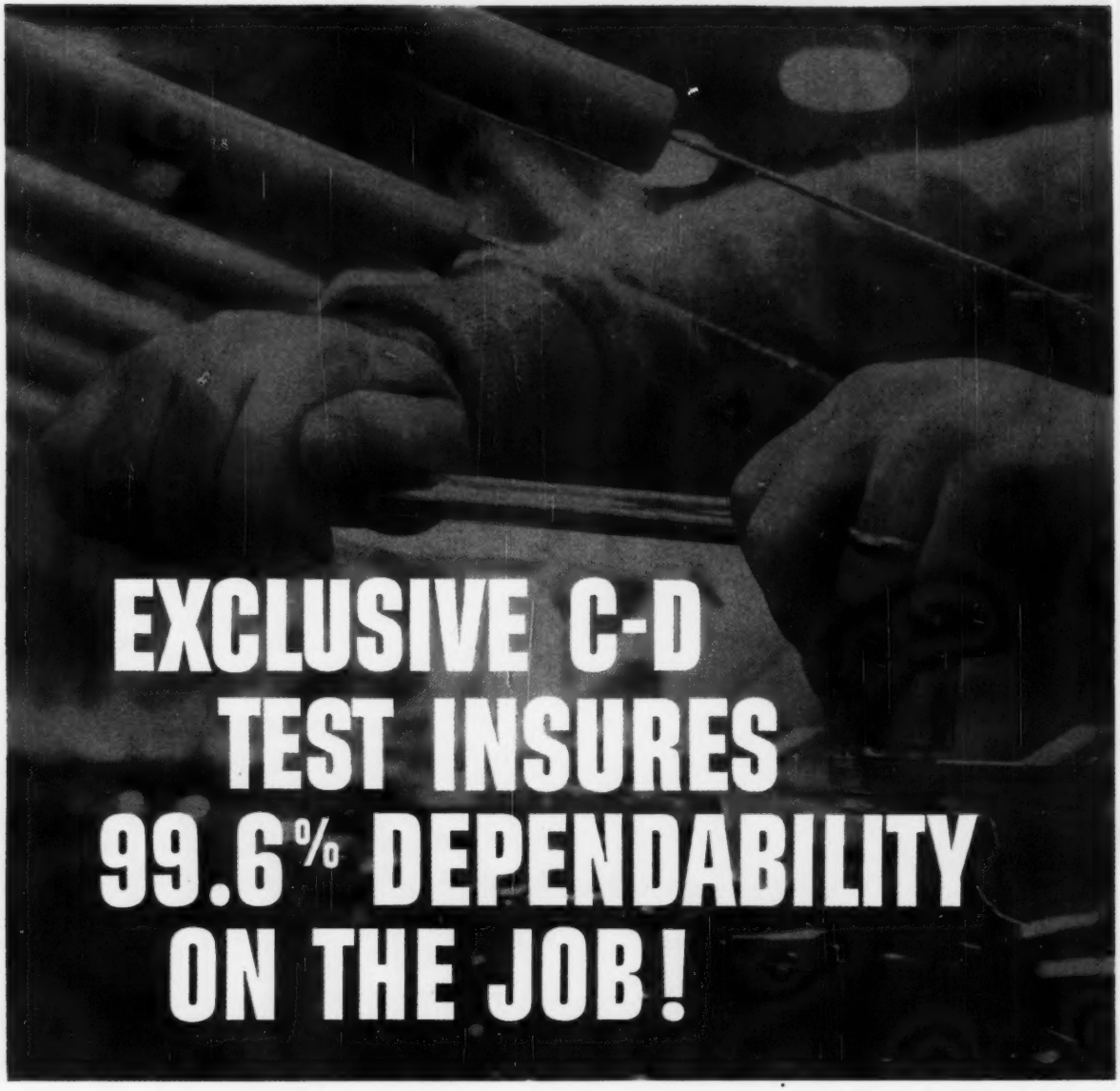
# Vertical Lift Metal-clad you perform normal breaker maintenance in 20 minutes

Ask your maintenance man which make of metal-clad switchgear is easiest and quickest to maintain, and it's an odds-on bet he'll tell you General Electric Vertical Lift.

He can show you why. For example, one man, in just 35 seconds, can remove the box barrier to inspect the contacts. The arc chutes do not have to be removed. In fact, he can complete routine maintenance of an entire Vertical Lift breaker in 20 minutes or less. Saving his time saves you dollars. General Electric Company, Schenectady 5, New York. 511-34

*Progress Is Our Most Important Product*

GENERAL ELECTRIC



# EXCLUSIVE C-D TEST INSURES 99.6% DEPENDABILITY ON THE JOB!

**THIS PAIR OF HANDS** reaching through a row of fuse links, is checking tightness of electrical connections on a series of C-D shunt capacitors. The hands belong to one of the many skilled C-D inspectors who make sure C-D capacitors are everything you want them to be...reliable, long-lasting and maintenance-free.

Before coming to this particular pair of hands, the capacitors were subjected to capacitance, leak, dielectric and energization tests. The energization test—*exclusive* with C-D—puts the units through an hours-long, full-voltage "heat run" that duplicates the same conditions the capacitors meet in the field. The capacitors aren't shipped unless they pass. That's why C-D capacitors deliver an unbeatable *99.6%-sure performance on the job.*

Invest your purchasing dollar in *internal* quality—the only place it really counts. See a C-D sales engineer today. Write to Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey.

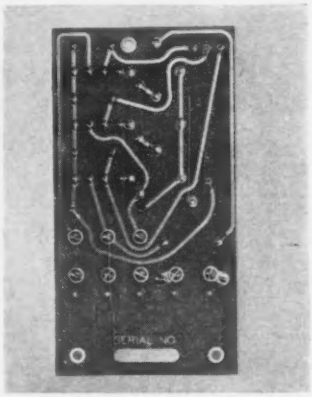
*Consistently Dependable*
**CORNELL-DUBILIER**
**POWER-FACTOR CAPACITORS**

15, 25, 33.3, 50 and 100 KVAR capacitors for every application, with lowest dielectric unit stress, highest major insulation level and power losses considerably below the NEMA limit of 3.33 watts/KVAR.

# PROGRESS IN PLASTICS

## NEW PHASE-FAILURE RELAY RELIES ON DI-CLAD® EPOXY-GLASS PRINTED CIRCUIT

Reliability of operation is the prime advantage of using CDF insulating materials. This reliability is amply demonstrated in a new phase-voltage-balance monitoring device produced by CDF customer Phase-Guard Co., and distributed by Stradley Engineering Co.



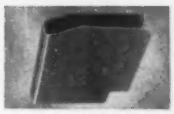
Phase-Guard, a new phase-voltage-balance monitor built on a CDF Di-Clad 28E epoxy printed circuit.

The Phase-Guard can be used to protect magnetically-controlled three-phase equipment that would be damaged if subjected to abnormal phase conditions such as single-phasing. In conjunction with a normally closed relay supplied from an external power source, it can even be used to monitor any three-phase supply line and sound an alarm when phase-failure occurs. Since this is a voltage-sensing device and only sensory and control-circuit wiring is required, Phase-Guard needs no costly series load connections.

The printed-wiring board which forms the foundation of the Phase-Guard relay is made from a CDF Di-Clad laminate. The combination of epoxy resin and glass cloth was chosen for its outstanding physical and electrical properties. High mechanical strength for direct mounting of the relay was one requirement. Minimum moisture absorption was another. Heat-resistance, arc-resistance, and insulation resistance were other factors which led Phase-Guard to choose CDF Di-Clad® epoxy-glass copper-clad laminates for this tough mechanical-electrical part.

Complete information on the monitoring device is available from Phase-Guard Co., Carnegie, Pa., or Stradley Engineering Co., Pittsburgh. For information on CDF epoxy laminates, write to CDF for Bulletin 11,200.

## UNIQUE MATERIALS, MODERN METHODS FOR POWER-EQUIPMENT INSULATION

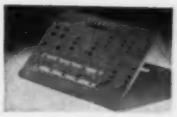


Arc Chute

Tapes

CDF offers the utilities the widest range of modern electrical insulating materials — Celoron®, a molded phenolic, highly adaptable and rugged, as shown by the contact

Contact Shaft



Panel Board

shaft (above, left) for an air circuit breaker; Dilecto® laminates (above, right) in completely fabricated or sheet, tube, or rod form; tapes of du Pont TEFLON TFE fluorocarbon resin, silicone-rubber, or Micabond®; and other new and old materials that have proved themselves in severe service.

CDF materials are readily fabricated, in any of CDF's three modern plants or in your own plant. Write for free machining handbook.

Look for CDF's catalog in Sweet's Product Design File, or send for literature pertinent to your interests and immediate needs. Better yet, send us your print or your problem, and we'll return recommendations.

## NEW CDF LITERATURE

Information on new grades, special applications, and outstanding properties of CDF insulating materials is made available regularly through CDF Technical Bulletins and Brochures.

The following literature is new. For copies of any bulletins listed, send the coupon below.

Epoxy Laminates—
Bulletin 11,200

Di-Clad Laminates—
Bulletin 11,900

Paper-Base Laminates—
Bulletin 11,110

Celoron Molded Products—
Folder C-59

Glass-Supported "TEFLON"—
Folder GST-58A

Polyester-Glass Laminates—
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**CONTINENTAL-DIAMOND FIBRE**
**NEWARK 15, DELAWARE**

Please send me the following CDF literature:

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**CONTINENTAL-DIAMOND FIBRE**
A SUBSIDIARY OF THE Bndd COMPANY • NEWARK 15, DEL.
In Canada: 46 Hollinger Road, Toronto 16, Ontario

# Only Sylvania VHO POWERTUBES*

## give you all of these Very High Intensity lamp advantages!

**1. More than twice as much light** as obtainable from standard fluorescent lamps of same size.

**3. Easier to handle** than competitive high intensity lamps . . . Sylvania VHO POWERTUBES weigh half as much as other shapes.

**2. Smooth surface**—the preferred tubular shape that does not catch and hold dust.

**4. Smaller in size**—T-12 1½" tube diameter permits better air circulation around the tube than larger diameter lamps.

**5. Lower in cost**—less expensive to buy and install, provide more lumens. The 8-foot, 200-watt VHO POWERTUBE, for example, delivers 15,000 lumens! Easier to stay clean, quicker to wipe clean than special shape lamps.

**7. Uniform light distribution** delivers full light output in any position.

**6. Does not require "oversized" fixtures**—helps keep fixtures costs down, avoids heavy tube strain on fixtures.

**8. Better optical control** permits full use of light directed exactly where *you* want it.

**And only Sylvania Fluorescent Lamps** are backed by the exclusive Sylvania Light Insurance Policy!

Guaranteed by Sylvania, the Policy specifies if, in your opinion, Sylvania's lamps do not perform better than the brand you are now using, you may return them to our distributor and get your money back.

*Trademark

Ask your Sylvania representative or supplier to see a copy of the revolutionary Sylvania Light Insurance Policy. Or write:

SYLVANIA LIGHTING PRODUCTS
Dept. 9L-7609, 60 Boston Street,
Salem, Massachusetts
*In Canada: Sylvania Electric (Canada) Ltd.*
*P. O. Box 1190, Station "O", Montreal 9*

SYLVANIA GENERAL TELEPHONE SYSTEM
Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

# The shape you want *and the service*

**--and it's as easy as saying "O-B" when you order switchgear or substations**

Is there any real difference between the two kinds of station insulators, Pincaps and Posts? Yes. Each excels in its own way. Pincaps, due to their petticoat shape, provide a multiplicity of dry, protected areas that give this type of insulator improved leakage characteristics when contaminated. Posts have inherent high strength and rigidity. Both types have excellent records as an insulating member.

Do you value experience in making these insulators? O-B started making Posts about 1914, and Pincaps about 1918. Backed by the finest production, laboratory, and research facilities in the industry, each has shared in constant improvement, and each is at the head of its class today.

Do you value low depreciation? Look in your own records. You probably have thousands of O-B station-type insulators in service on your system. Your own figures will point up O-B's clear superiority.

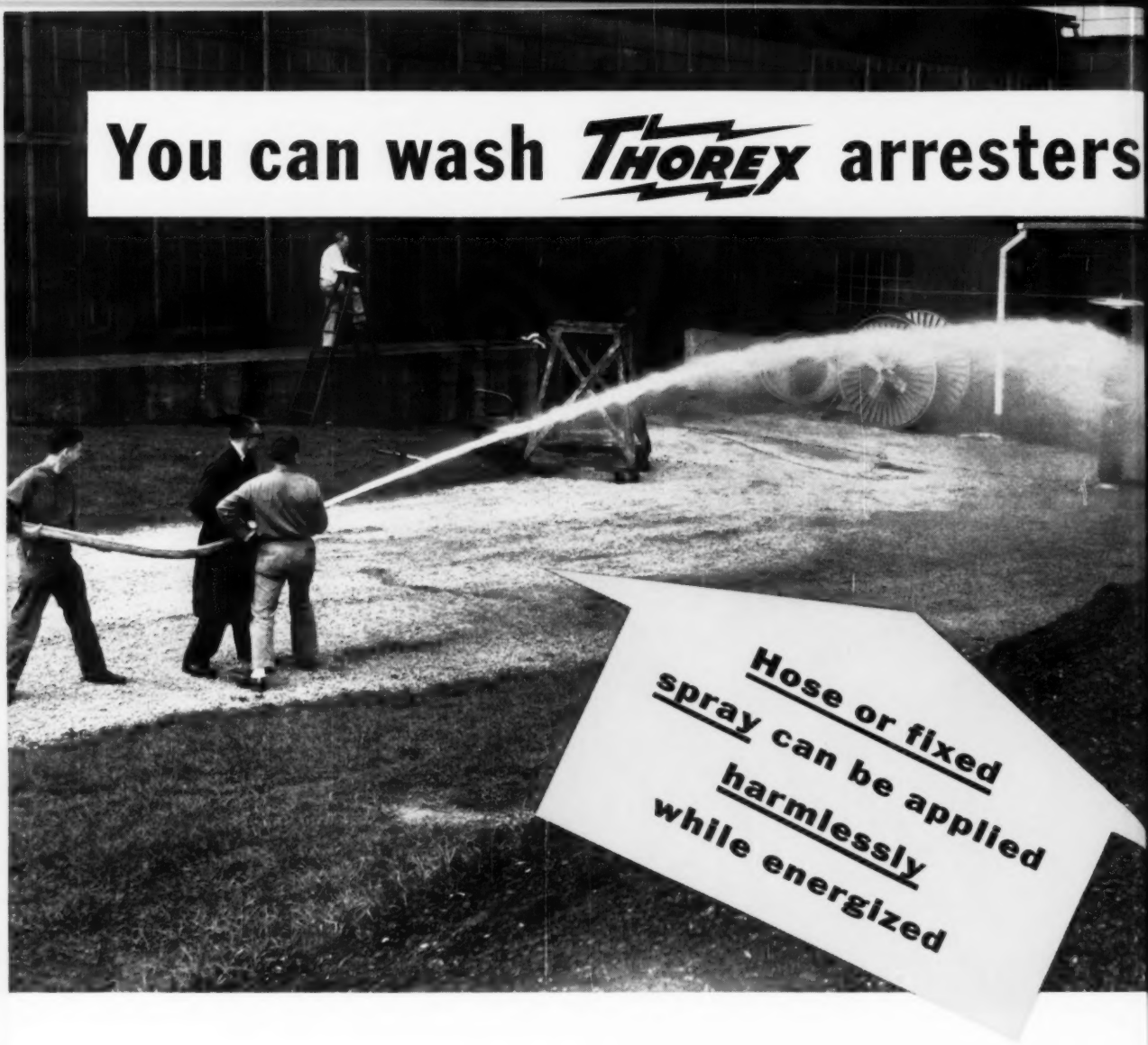
Independent manufacturers of switchgear and substations will gladly supply the insulator of your choice -- *if you only make that choice known.* When you say "O-B insulation," you can have either shape you want, and the performance that you hope to get.

OHIO BRASS COMPANY, MANSFIELD, OHIO

**Ohio Brass** HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

# You can wash THOREX arresters




Once, you didn't dare wash a high voltage arrester. Dangerous surface leakage currents resulted from the deluge of water, plus contamination. These were introduced into the arrester circuit at every unit-to-unit connection of traditional stacked-unit design. Under unfavorable conditions, this imposed voltage in excess of rating on a portion of the stack, sometimes resulting in destruction.

Here you see a Thorex Dynagap arrester for 345-kv service being subjected to the output of a fire hose. The energized arrester was first severely contaminated with a thick dried layer of salt. No internal sparkover occurred, and the arrester retained its normal protective condition in every respect.

*Single-unit* Thorex construction accounts for this one-time impossible performance. Absence of all inter-unit connections forces leakage currents to bleed harmlessly over the outside surface to ground.

Because contamination is so common, washing by hose or fixed spray is becoming routine in many stations. Now you can include your arresters -- if they are O-B Thorex!

This is another reason -- one of many -- for installing Thorex Dynagap lightning arresters in your new station construction.

**OHIO BRASS COMPANY, MANSFIELD, OHIO**

Ohio Brass

HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
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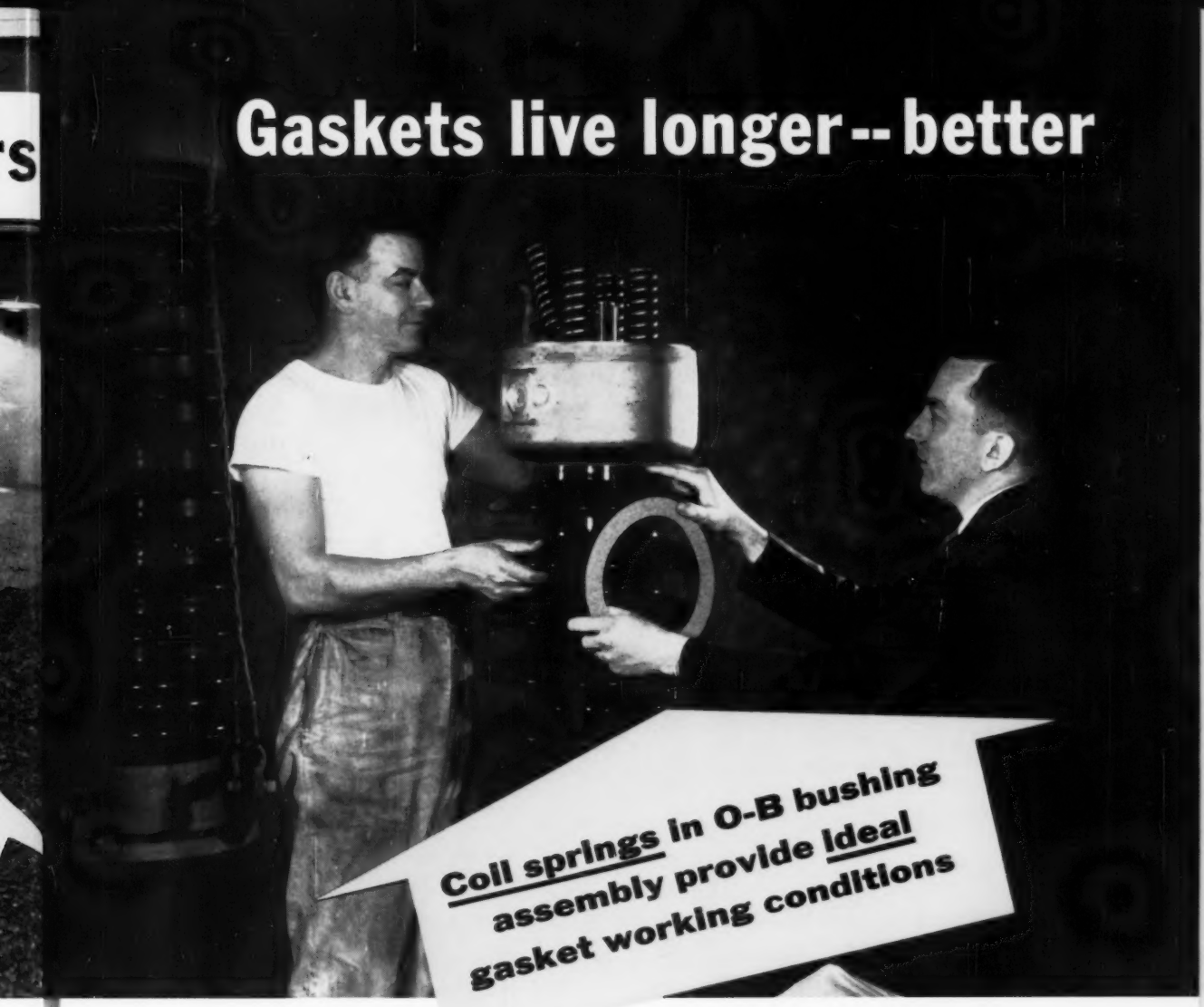
4924-H2

# Gaskets live longer -- better




Without enough pressure, a gasket will leak -- with too much pressure, you crush-out its life! And even the best of gaskets age. When they do this they lose physical volume. Today's correct pressure may be inadequate tomorrow. Or, over-do it today, and you speed-up tomorrow's arrival. Intelligent bushing designers look at gaskets as "living" things. O-B bushings have had this intelligent treatment.

Live pressure, exerted by a series of *coil* springs, accomplishes two important things in proper gasket loading. First, a coil spring produces *known force.* Pounds-per-square-inch on gasket joints can be computed by engineers and, more important, can be produced in routine factory assembly. Second, a *coil* spring has uniform compression over considerable amplitude of movement. As gaskets inevitably lose volume, the original sealing pressure is still effective. Even if the bushing is severely shocked in transit, optimum gasket compression is instantly restored. This assembly principle was developed and pioneered by O-B.

After nearly 50 years of successful bushing experience, O-B has accumulated some valuable know-how. It shows up in many places -- ultimately in service records. It is very easy to get. On orders for new station apparatus, simply say "O-B equipped." Name it, and you can have it!

**OHIO BRASS COMPANY, MANSFIELD, OHIO**

**Ohio Brass** HOLAN

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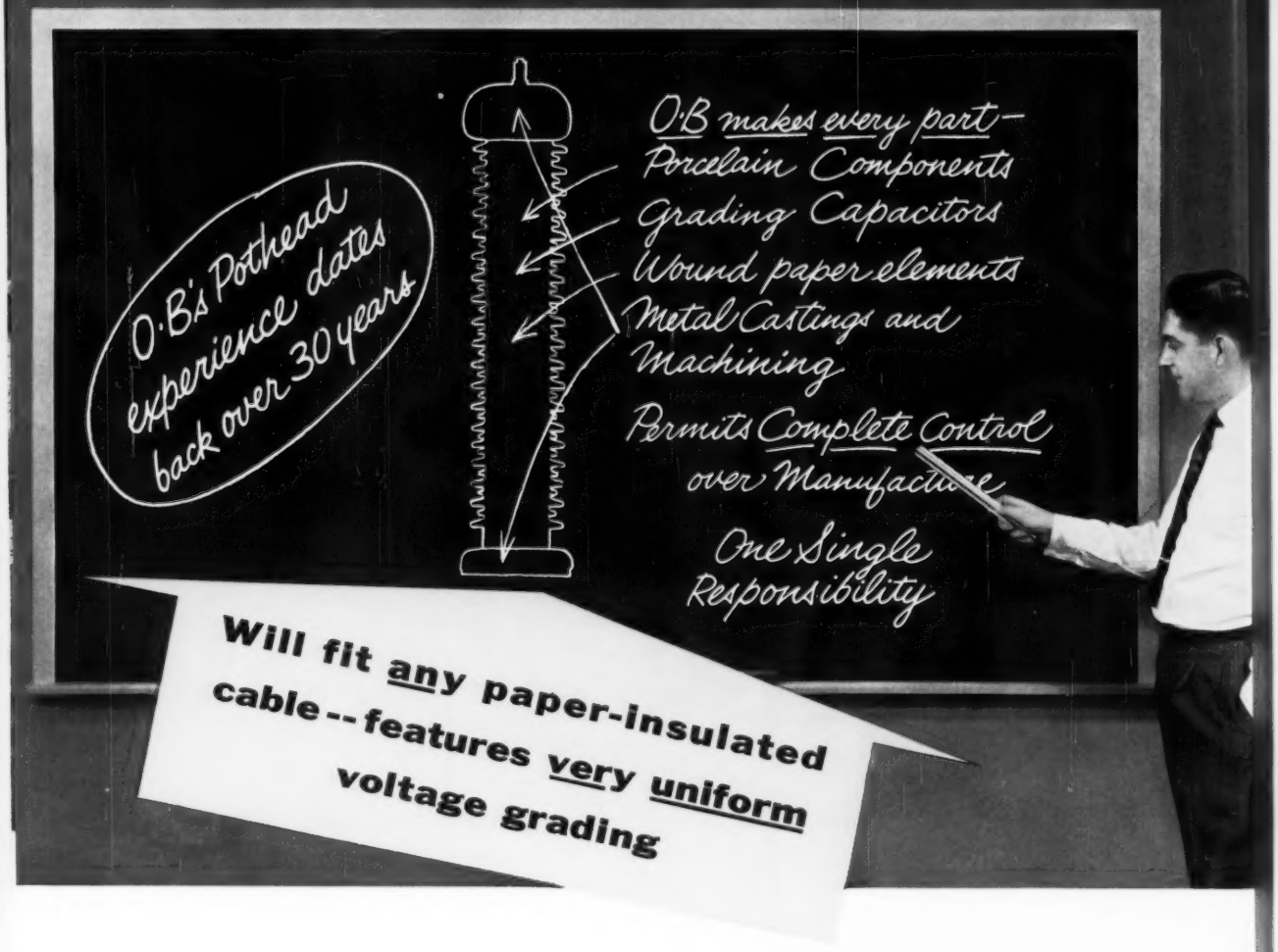
4924 H3

# O-B's new pothead nears completion


O·B's Pothead experience dates back over 30 years
O·B makes every part—
Porcelain Components
Grading Capacitors
Wound paper elements
Metal Castings and Machining
Permits Complete Control over Manufacture
One Single Responsibility
Will fit any paper-insulated cable -- features very uniform voltage grading

You'll hear more about the new O-B pothead very soon. It will work with any kind of paper-insulated, oil-impregnated cable. Capacitors within the relatively small porcelain casing give it uniform internal grading. Installation is simplified and materially speeded-up. Cable end exposure during construction is minimized. These potheads will be available for all voltages of 115 kv and above, and for both low and high pressure systems.

Furthermore, every part of this new O-B pothead comes from *one manufacturer* -- one overall responsibility, plus detailed technical control over even the smallest item. Only O-B, with its complete production facilities in high voltage porcelain, metal-working, paper-winding, and capacitor manufacture, can offer such an obvious advantage.

If you anticipate installation of underground high voltage cable, please give us the opportunity to discuss your terminal requirements with you. We think you will agree it will be to your advantage.

OHIO BRASS COMPANY, MANSFIELD, OHIO

**Ohio Brass**

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
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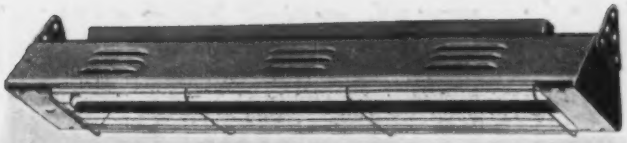


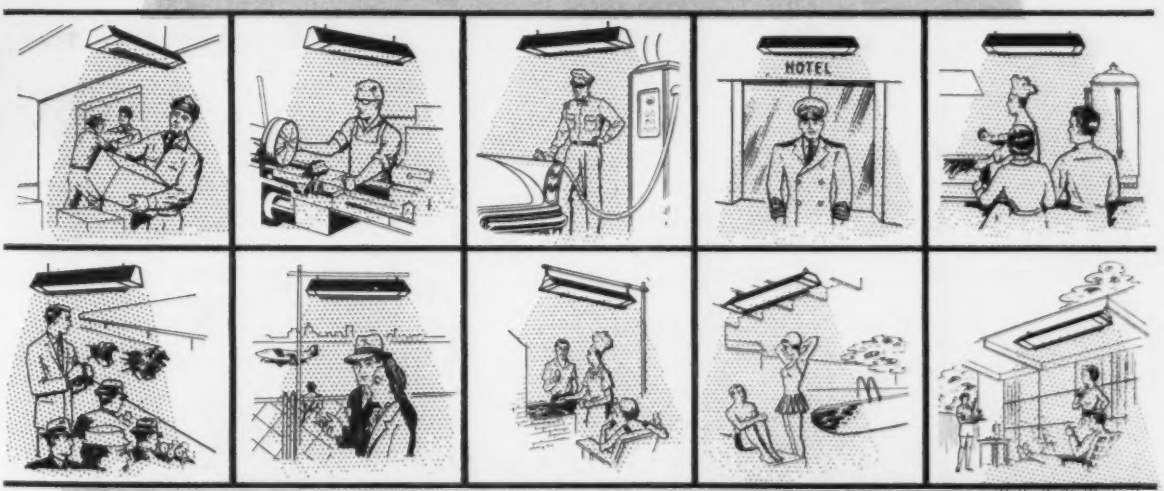
# ELECTROMODE® Quartzone TUBE INFRARED *Electric* HEATER

## Controlled Area Heating...Indoors or Outdoors

High energy infrared rays emitted from the Quartzone Tube are channeled in a rectangular area by a scientifically designed parabolic polished aluminum reflector, making it possible to concentrate the heat on a specific area, indoors or outdoors. Like the sun, these infrared rays warm persons or objects upon which they are directed, and this warmth is enjoyed regardless of surrounding temperature. *In industry,* this heater has great utility for providing warmth in exposed areas, like loading docks, and in warehouses and buildings with high ceilings; also for spot heating, dyring, and many process applications. It is ideal for use in outdoor areas, such as patios, swimming pools, barbecues, etc.

The heater can be controlled by simple on-off switch, time switch or thermostat. Heaters are supplied with universal brackets for chain suspension or for bolting to ceiling and wall brackets. Built to withstand the elements, with a louvered, weather-proof housing, bonderized and finished in gray enamel.

**Shown below are a few of the many uses.**




The high efficiency of this heater is due to the fused quartz tube. The infrared rays emitted by the metal coils pass through this amazing material without appreciable loss of heat. Heat is *instant.* The Quartzone Tube has high resistance to thermal shock, and even at red heat will withstand splashing rain or snow without cracking. Guaranteed for one year, but in actual service will last many thousands of hours.

*REG. U. S. PAT. OFF.

***Complete Electromode line of electric heating equipment includes:*** Baseboard Heaters, Wall and Portable Fan-Circulating Heaters, Radiant Convection Panel Heaters, Floor Insert Heaters, Duct Heaters, Radiant Cable Heat, Portable and Suspension Industrial Unit Heaters, and Farm Heaters for Milk House and Pump House.

**For complete information and Specifications ask for Form EC-248.**

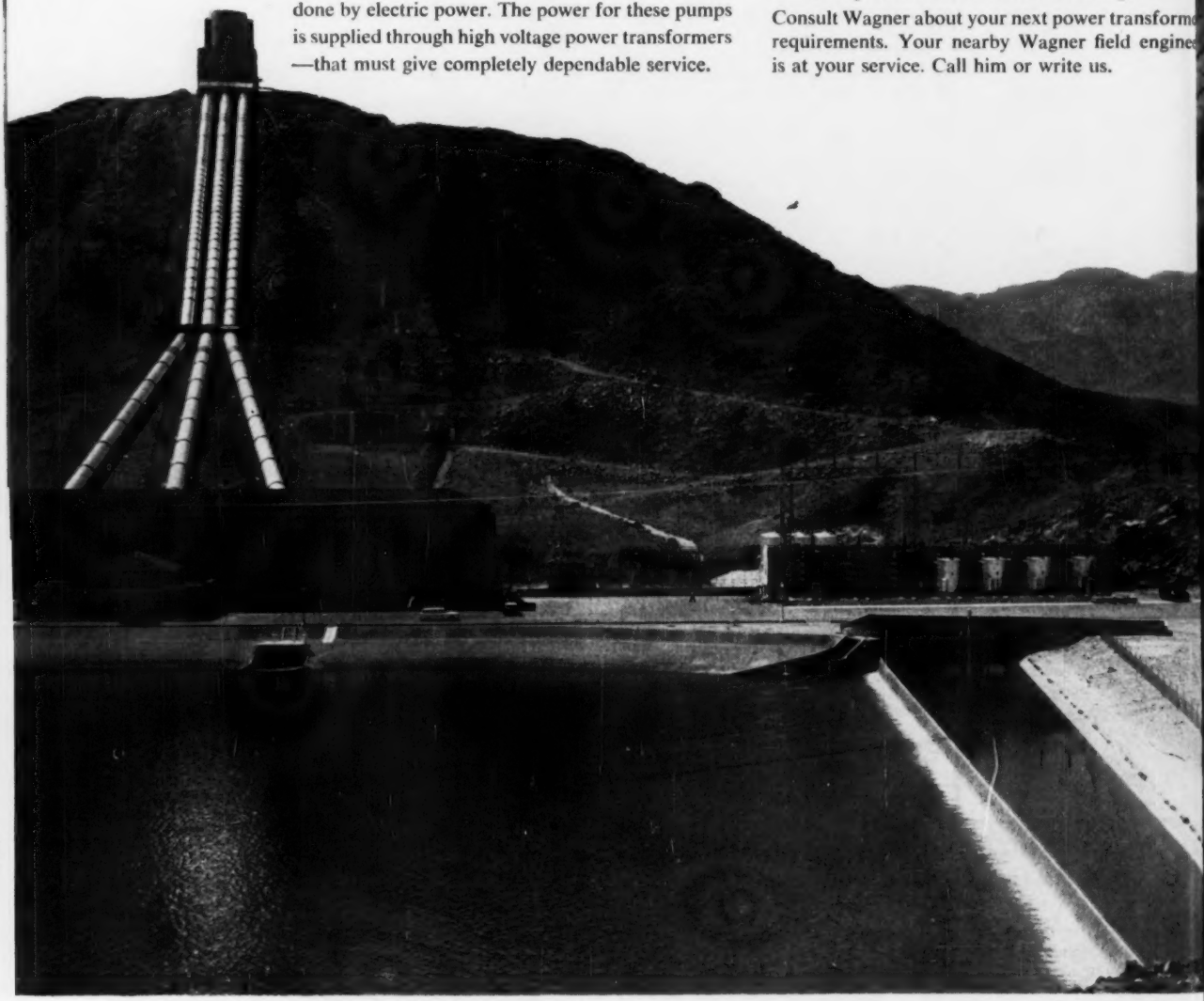
***ELECTROMODE***
*division of Commercial Controls Corporation*
**DEPT. EW-59 ROCHESTER 3, NEW YORK**

# TEN 230 KV WAGNER POWER TR
# *DOUBLE* CAPACITY OF SOUTHERN CALIFORNIA WA

The Metropolitan Water District of Southern California extends into five California counties, and has a population of 7,000,000 people. Water from the Colorado River is carried by the District's aqueduct across the entire state of California through an aqueduct system 654 miles long. Pumping stations along the aqueduct lift the water 1617 feet over mountain barriers—a tremendous job, done by electric power. The power for these pumps is supplied through high voltage power transformers —that must give completely dependable service.

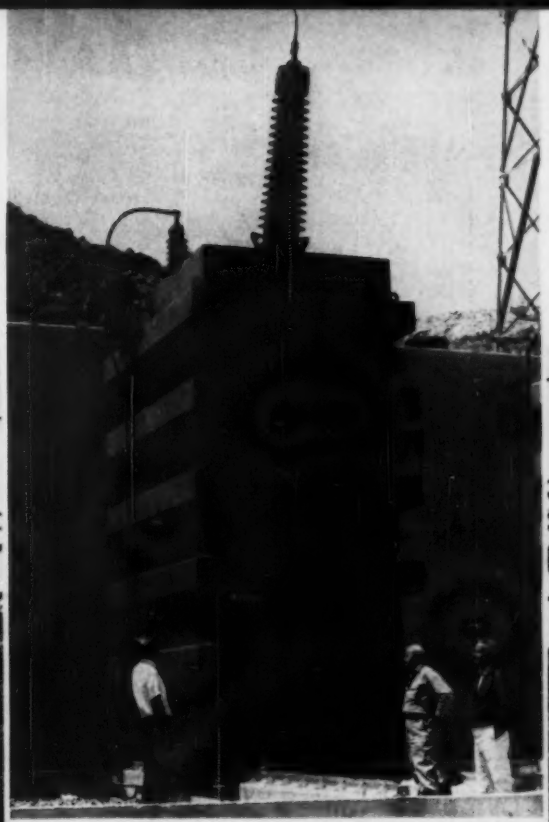
To fill the need for more water, the Metropolita Water District recently installed ten Wagn 230,000 volt power transformers at three of th pumping stations along the system. Three of the transformers are rated 5500 kva—seven are rate 15,000 kva. They will help supply enough pow to double the capacity of the system. The tran formers are oil-immersed, water-cooled, with a alternate provision for forced-oil cooling.

Consult Wagner about your next power transform requirements. Your nearby Wagner field engine is at your service. Call him or write us.



**MORE WATER FOR SOUTHERN CALIFORNIA** is boosted over a mountain barrier at the Iron Mountain pu lift through three huge pipes, some 10 feet in diameter. Ultimately a billion gallons of water per day will be lifted through this pumping station.

# TRANSFORMERS HELP WATER SYSTEM



One of the three 230 kv Wagner Power Transformers added to the Eagle Mountain pump lift.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

## Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

SERVING 2 GREAT GROWTH INDUSTRIES . . . ELECTRICAL . . . AUTOMOTIVE

WT59-12

# BIG NEWS!

## ROECLAMPS®

### with associated cables

## NOW FOR 15 KV

**1. TURN THE NUT...** and open. A few seconds—and the Roeclamp is on the messenger.

## MINIMIZE TREE PROBLEMS, REDUCE OUTAGES, SAVE 75% OVER SELF-SUPPORTING CABLES

When Roeclamps with Associated Cables were introduced recently for 5 kv and 8 kv systems, the response was immediate and tremendous. Now the same advantages of greatly reduced cost, much easier installation, compactness, added attractiveness, greater current-carrying capacity, easy servicing, and virtual elimination of outages caused by falling limbs, are available for 15 kv systems with new 15 kv Roeclamps with Associated Cables.

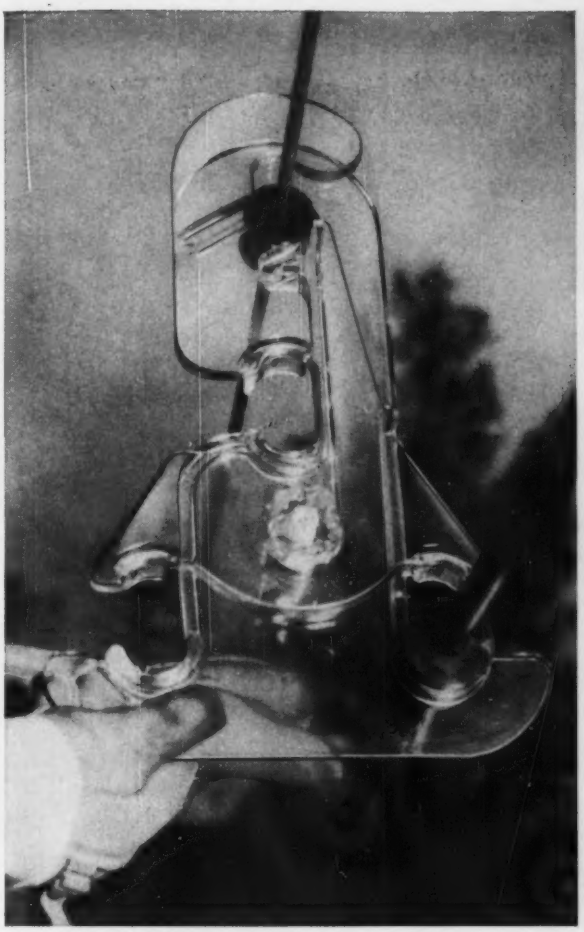
The pictures show you how easy installation of each Roeclamp is, even with "boxing gloves" on. It takes under a minute, without tools. Phase identification is positive at a glance, since all cables are in the same relative position all along the line. What's more, you can add phases, or remove them, and the system can be reinforced, without *removing Roeclamps from the messenger!*

And what can you expect when Roeclamps with Associated Cables are in operation? Better voltage regulation, for one thing, because of low reactance. Higher current-carrying capacity, too. And the strong messenger practically eliminates outages caused by falling limbs or lightning. Conductors are available in copper or aluminum. Roebling's engineers will be happy to select the best insulation for your application.

In a nutshell, if you have a 15 kv system, or are contemplating one, get the vital facts about new 15 kv Roeclamps with Associated Cables now. Your Roebling representative will gladly demonstrate the Roeclamp. Just give him a call—or write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

**ROEBLING**

*Branch Offices in Principal Cities*
*Subsidiary of The Colorado Fuel and Iron Corporation*



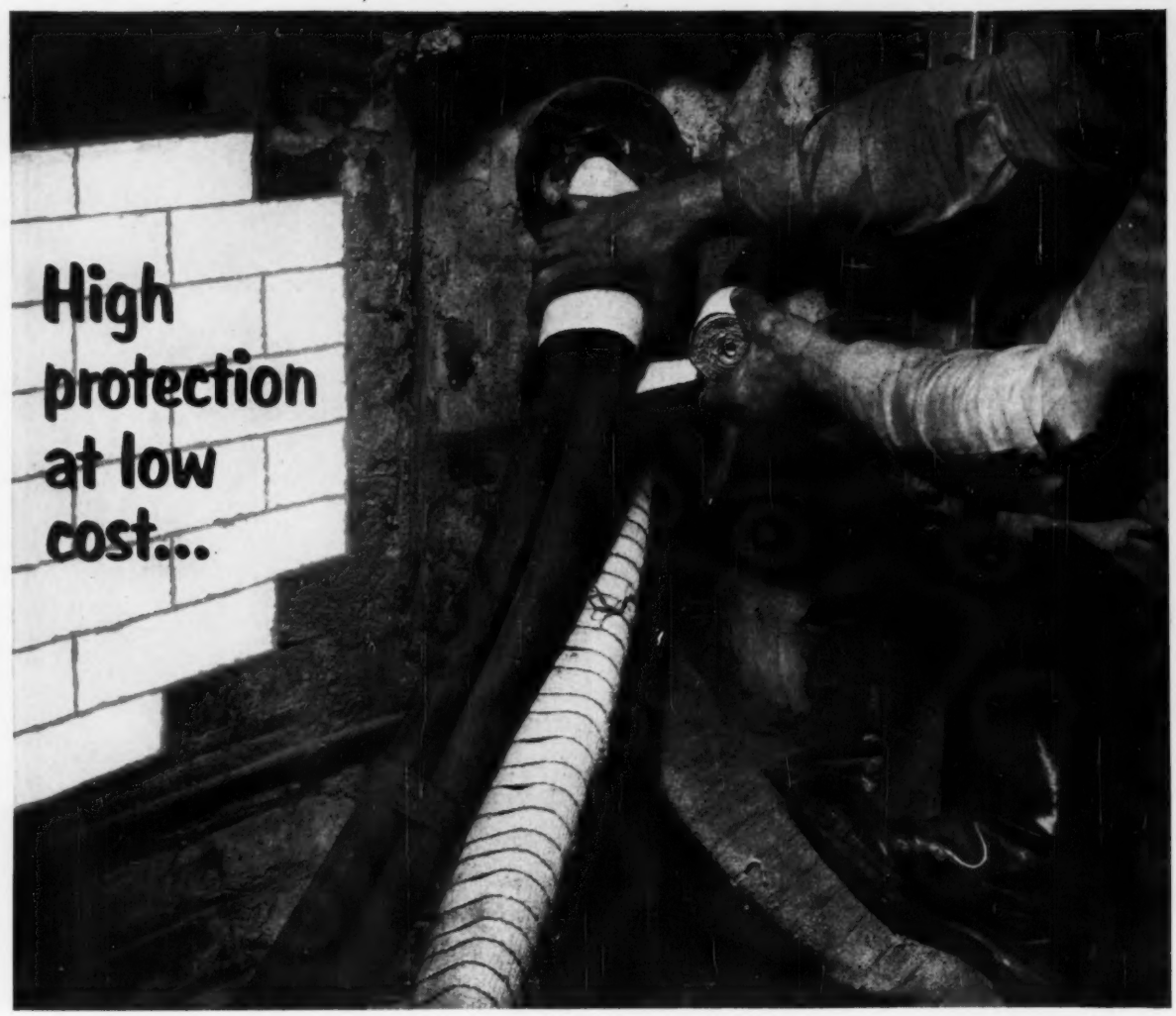
**2. PUSH UP . . .** the Roeclamp is ready for conductors! They drop easily into place.

**3. CLOSE . . .** and hand-tighten. Roeclamp is completely installed—without removing gloves, and without tools!

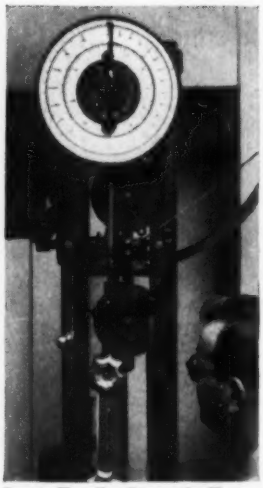
## About New 15 KV Roeclamps

**They're strong—test to 1800 lb breaking strength! Tough Plexiglas* defies weathering, has top electrical properties. Conductors are at 7-inch centers for best electrical protection, easy installation. Roeclamps have unit construction, no separate parts. The big nut can be loosened readily, even with "boxing gloves" on. It hand-tightens. No tools required ever . . . no clamp is easier to install. And you never have to remove the Roeclamps for phase changes or repairs. Roeclamps come complete with grommets to fit the messenger and cables you order. Only 34 Roeclamps are required every 1000 feet.**

*Reg. T. M.—Rohm & Haas Company




## J-M No. 55 Cable Fireproofing Tape helps contain blowouts—isolate trouble



Scott Tensile Strength Tester proves J-M No. 55 Cable Fireproofing Tape maintains its high strength even after burnout.

Reduce the danger of arc multiplying your troubles in the event of cable failure. Repeated tests prove Johns-Manville No. 55 Tape helps contain arc and splash . . . and retains substantial strength even after being burnt out!

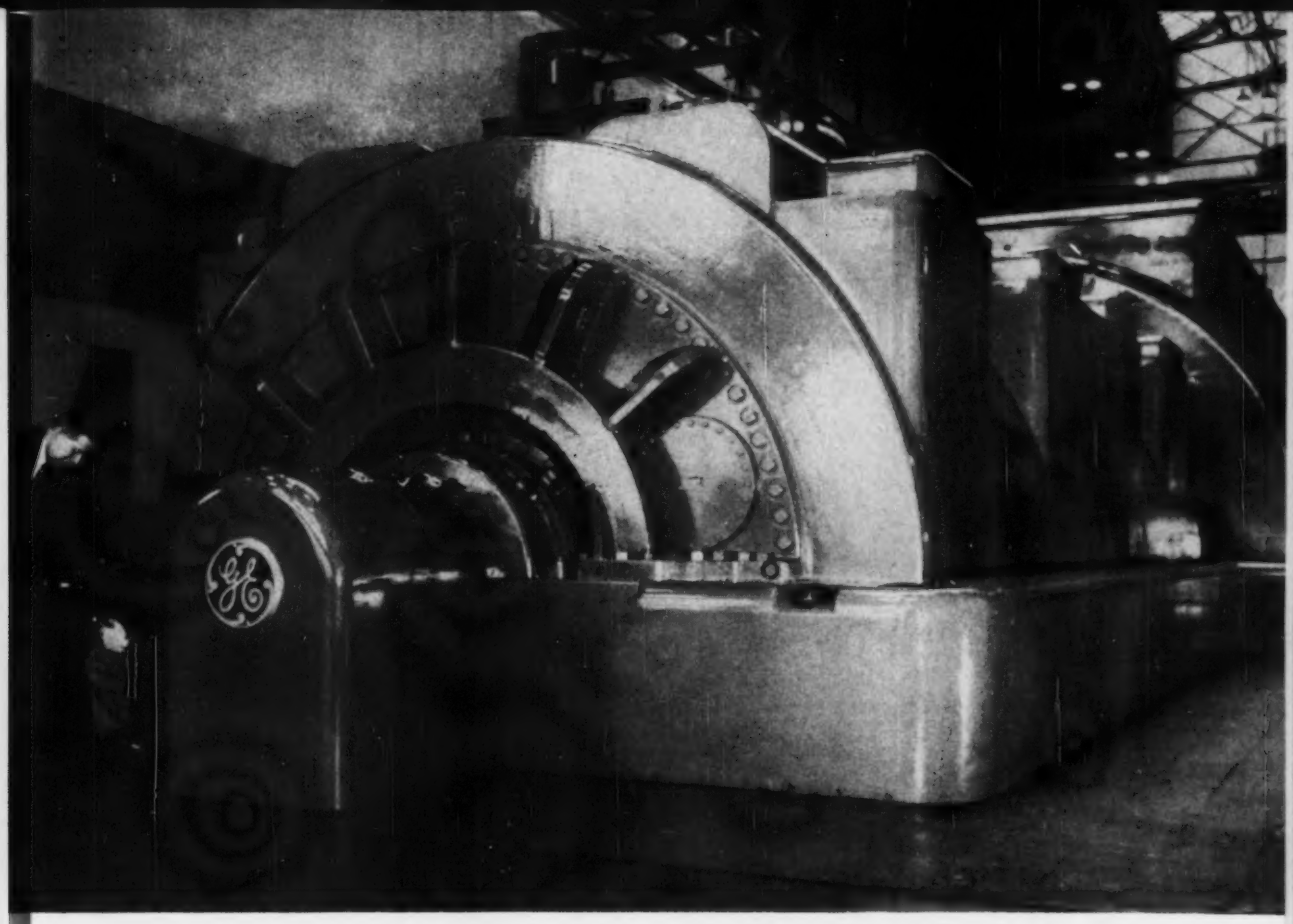
Leading public utilities have chosen J-M No. 55 for its long-range economy plus its dependability. In addition to exceeding their protection requirements, it saves time and money because it costs less to apply. It goes on faster because it's applied *dry*, wraps easily even in confined spaces.

J-M No. 55 protects cables for years under manhole conditions because of top quality asbestos construction and thorough impregnation with silicone. Produced by J-M in an economical thickness, it is high in water repellence, low in water absorption . . . resistant to flame, heat, oil, fungus and mold . . . nonsagging . . . abrasive resistant. The selvaged edges keep ground water out . . . and threads cannot pull out.

For complete details, and test data on J-M No. 55 Cable Fireproofing Tape, write for new brochure TX-6A. Address, Johns-Manville, Box 14, New York 16, N. Y. In Canada: Port Credit, Ontario.

**JOHNS-MANVILLE**

JOHNS-MANVILLE JM PRODUCTS



# Philadelphia Electric selects Gulfcrest oil to lubricate its new 175,000 kw generator

With the addition of a new 175,000 kw turbo-generator at the Schuylkill Station, Philadelphia Electric Company has boosted its system capacity to 2,712,250 kw.

Gulfcrest is the lubricant for many Philadelphia Electric generating units, to the complete satisfaction of this prominent utility. On the basis of their fine experience with this oil, Gulfcrest was chosen as the lubricant for the new #1 Schuylkill generator, which now has approximately 15,000 gallons of Gulfcrest 44 in its lubricating system.

The new unit is a 175,000 kw tandem-compound turbo-generator operating at 3600 rpm and under 2400 lbs. steam pressure. It is one of the largest and most efficient single shaft turbines in operation today.

Philadelphia Electric, like other utilities using Gulfcrest in their turbines, can expect many years of service from this oil—with neutralization numbers remaining consistently low, and systems free from sludge and rust. No wonder that in Gulf's marketing area, more power is generated by central station steam turbines lubricated with Gulfcrest than with any other oil.

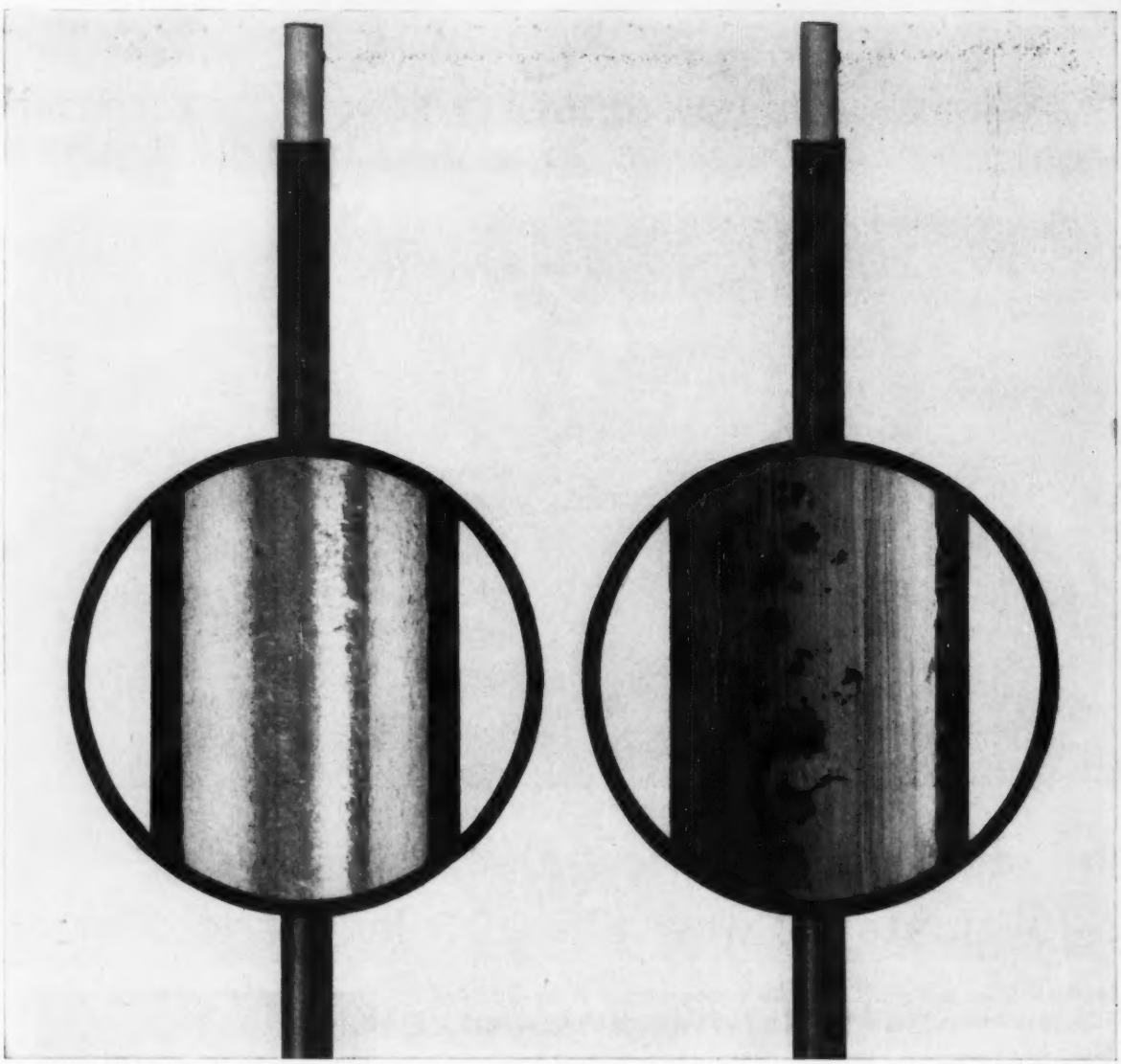
For more information on Gulfcrest, just call your nearest Gulf office or write for illustrated booklet.

Checking oil temperature in #1 Schuylkill unit at Philadelphia Electric are, left N. L. Gregg, Jr., Gulf Sales Engineer and George Hockenbury, Turbine Operator.

**GULF OIL CORPORATION** • Dept. DM, Gulf Building, Pittsburgh 30, Pennsylvania

GULF

**GULF MAKES THINGS RUN BETTER!**



# QUALITY CONTROL MAKES THE DIFFERENCE IN ALCOA COVERED CONDUCTOR

Most covered conductor looks about the same . . . and, for the first few years, *may* perform about the same. But looks can often be deceiving and sometimes very costly. For the fact is: all covered conductor is not alike. There's very often a big difference . . . and, in Alcoa covered conductor, that big difference is quality control.

Take the problem of dirty wire, for example, shown in the illustration of polyethylene covering above. Though a small amount of grease, dirt and mill pickup on bare conductor may not be detrimental, such is not the case with covered conductor. In covered conductor, if the wire is not absolutely clean and free from grease and foreign particles, voids, pinholes and air pockets may result when the covering is applied. This causes uneven covering, creates points of weakness which often lead to shortened life. But you never have to worry about this problem with Alcoa covered conductor . . . continuous quality control prevents these hidden weaknesses by eliminating their causes.

Alcoa covered conductor undergoes the most exhaustive series of tests in the industry . . . tests before, during and after manufacture to make sure you receive the very best product which can be made by the most modern production methods.

Recognize this big difference of quality control in your installations by specifying Alcoa . . . in neoprene, polyethylene or special coverings. No extra cost, but savings through added reliability and longer life are bound to be substantial. Aluminum Company of America, 2110-J Alcoa Building, Pittsburgh 19, Pa.

*Your Guide to the Best in Aluminum Value*

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV

ALCOA ALUMINUM

# Busy making plans for the coming year?

***LOOKING FOR WAYS TO:***

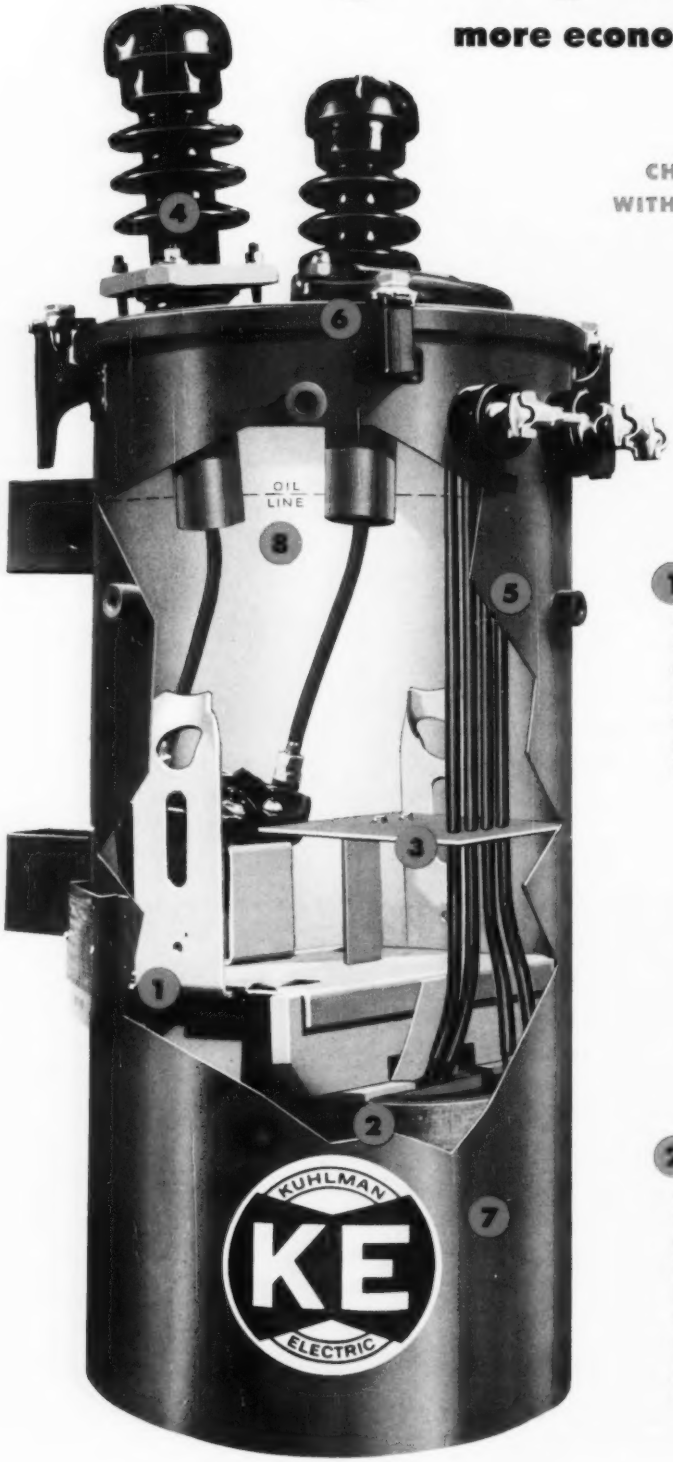
*CUT COSTS... MEET GROWING LOADS...*

*PEP-UP YOUR DISTRIBUTION SYSTEM?*

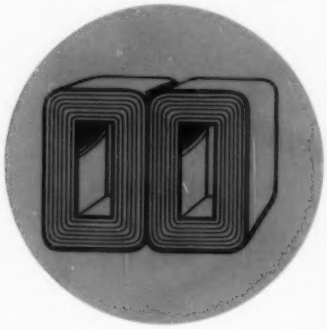
**HERE'S IMPORTANT NEWS FOR YOU**

# The Kuhlman '60

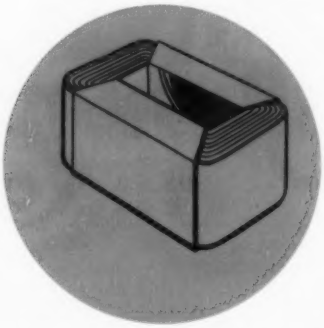
## gives you . . . more dollar value . . . more economy . . . better performance and greater reliability.



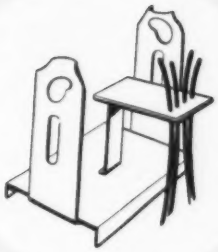

CHECK YOUR SPECIFICATION STANDARDS WITH THESE 8 MAJOR KUHLMAN FEATURES:



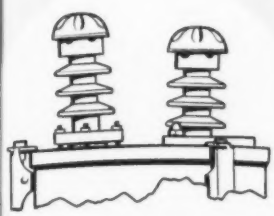
**1 "Low-Loss" BENT IRON Core** . . . for more than a quarter of a century, the key to modern transformer design. Now, improved to give lower exciting current—lower impedance—better regulation—new operating economy. Controlled-atmosphere annealing, coated laminations, firm, compact construction assure full utilization of the best inherent qualities of grain-oriented steel.



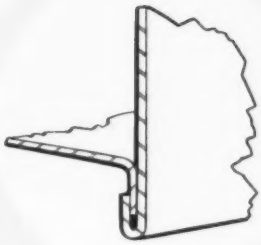
**2 "Long Life" Coil** . . . electrically and mechanically stronger. Special coated insulation bonds windings and insulation into a tight, compact unit. Generous oil ducts provide cooler operation, longer life, higher short-time overload capacity. Production-Line Impulse Testing assures insulation will withstand severe lightning and line surge conditions. Individual winding layers are braced to prevent shifting. Entire coil is rigidly supported to withstand short-circuit stresses.



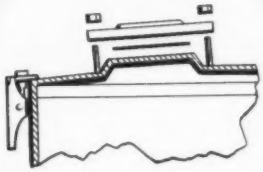
**3** **"Shake-Proof" Leads** . . . insulated and firmly held in lead guides. Lead size, connector and crimping are coordinated to insure snug fit, corrosion-free connections. Connectors—designed and micro-checked for minimum 85% pull-out strength and greater than 100% relative conductivity—won't work loose . . . Operate cooler than the conductor, itself.



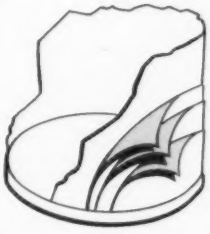
**4** **Original "Quick-Grip" HV Connector** . . . cover or sidewall mounted. The big hand-grip insulating connector permits fast, simple line connections. Also, prevents outages caused by birds and animals coming in contact with energized parts or short-circuiting across high voltage terminals. Both sidewall and cover mounted designs accommodate either copper or aluminum conductors and minimize cold flow of aluminum.



**5** **"Space-Saving" Tank** . . . slimmer and trimmer. New designs save space on the pole or in storage. All tanks are seam welded and pressure tested for leaks. Rolled-under base provides added strength, moisture drainage, and easier handling. Brackets are projection welded in a continuous weld to eliminate crevices and moisture traps. Cover fits tightly to seal out moisture.



**6** **"Air-Tight, Oil-Tight" Seal** . . . moisture can't get in—oil can't get out. Pressure-sealed, moisture-proof gaskets that combine long life with mechanical strength and resiliency fully protect insulation and oil. At no point is there metal-to-metal or porcelain-to-metal contact except to limit gasket expansion. Sizes and gasket composition tailored to the application assure an air-tight, leak-free seal.



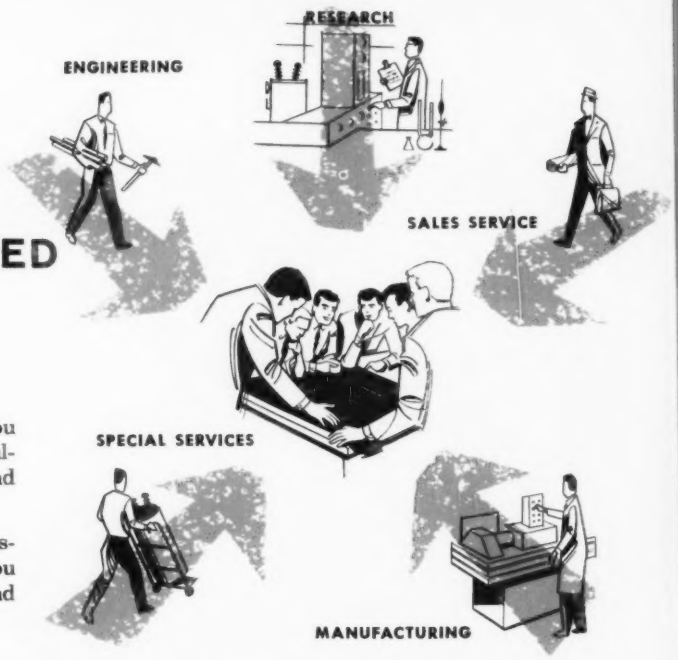
**7** **"Hot Spray" Finish** . . . NEMA grey outside, gleaming white inside. Both finishes provide maximum all-season protection. Hot Spray puts less solvent, more weather-resistant paint solids on the tank surface. Result: thorough, even coverage with a heavier-filmed, longer lasting, denser finish.

**8** **"Perma-Kuhl" Cooling** . . . protects and adds years to service life. Perma-Kuhl is a special, inhibited, highly refined mineral oil that stays fresh and in perfect operating condition long after the reclaiming point of ordinary oils. The inhibitor increases maintenance-free life by retarding oxidation and oil sludging which tend to weaken insulation and impede oil circulation.

**AND HERE'S HOW KUHLMAN LOCALIZED SERVICE . . .**
**STOCKING . . . AND MANUFACTURING WORKS FOR YOU**

# KUHLMAN TRANSFORMERS

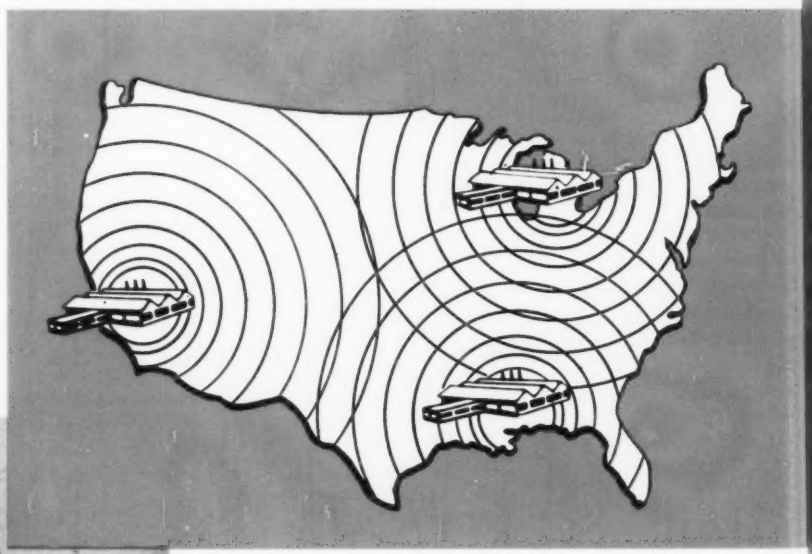
# SPECIALIZED MANUFACTURING AND SERVICE...CONCENTRATED EXCLUSIVELY ON YOUR TRANSFORMER NEEDS




All functions at Kuhlman concentrate on bringing you the best service, the best transformer possible. Kuhlman has spent more than 65 years developing and perfecting transformers, exclusively.

This long-standing reputation and years of transformer specialization is your assurance that when you specify Kuhlman you get quality, performance, and proven reliability.

# THREE MAJOR MANUFACTURING AND SERVICE CENTERS...TO SERVE YOU IMMEDIATELY



There's no waiting for shipments—no need to overextend your own inventory. Most popular Kuhlman pole-type ratings can be shipped "off the shelf" direct from stock to any part of the country. Three regional factories, 30 distributing centers, and 49 sales offices form a service network that covers the country. Order Kuhlman and get the transformers you need—when you need them.

# KUHLMAN TRANSFORMERS

*Manufacturers of transformers since 1894*

**KUHLMAN ELECTRIC COMPANY, Birmingham, Michigan**

**PLANTS: Bay City, Mich,; Crystal Springs, Miss.; Salinas, Calif.**

Litho in U.S.A.

## Neoprene jacketing on the job...at -65° F.

*Specially compounded neoprene jackets can withstand mandrel wrap tests down to -65° F.—often required in military specifications. Even at 65 below, neoprene jackets remain flexible for portable uses. More important is neoprene's excellent retention of low-temperature properties after years of aging. This holds true for all of neoprene's combination of properties . . . properties that insure long-term reliability. For information, write E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. EW-9, Wilmington 98, Del.*

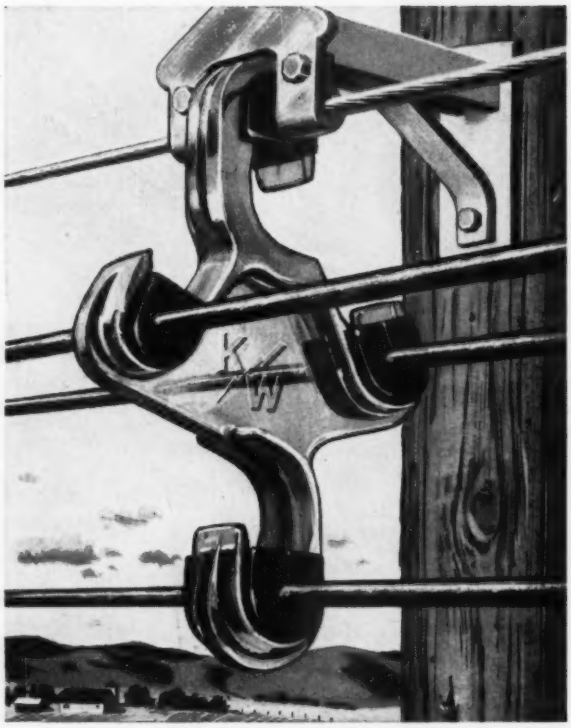
DU PONT
REG. U. S. PAT. OFF.

SYNTHETIC RUBBER

NEOPRENE
HYPALON®
VITON®
ADIPRENE®

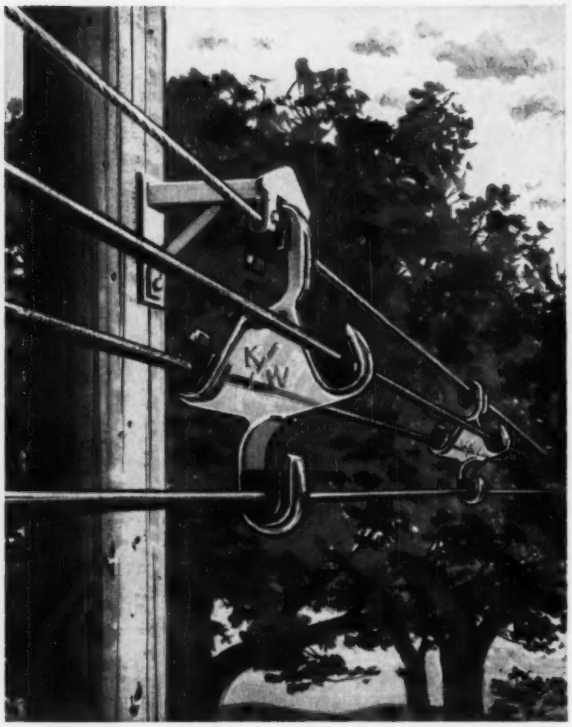
**Better Things for Better Living . . . *through Chemistry***

# NEW KW SPACER TYPE AERIAL ADDS STRENGTH, CUTS COSTS,



### One-Piece Design—Supports 1200 Pounds

New solid spacer design has no loose parts nor movable pieces . . . it's simple, reliable and strong. Can support a minimum distributed load of 1200 pounds. Easy to install, since only one conductor is handled at a time. Snap-in grommets shaped to ease installation. Can be used with or without crossarms; standard hardware available from many suppliers.

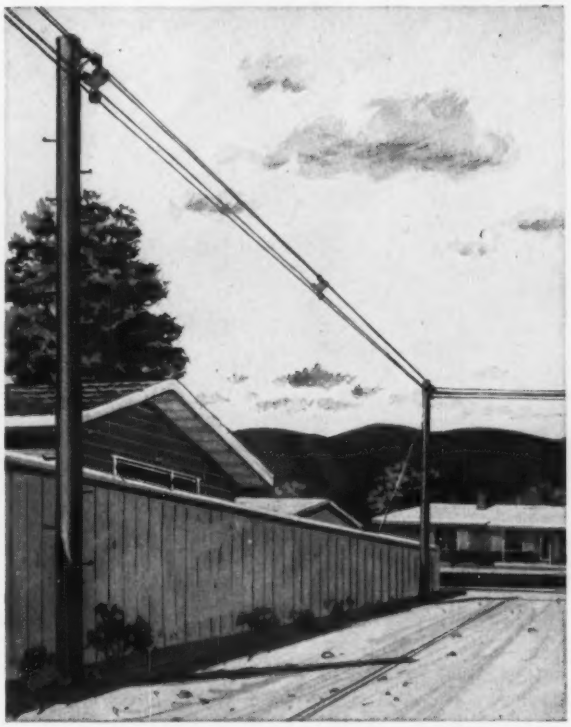


### Cuts Material Costs and Tree Trimming

A KW Spacer Cable system can be installed for as little as one half the cost of standard pre-assembled aerial cable!

Compared to open-wire weatherproof, the reduced tree trimming and improved system dependability resulting from messenger supported cables can justify the spacer system's slight additional cost.

# CABLE SYSTEM IMPROVES APPEARANCE



**Reduced Spacing Improves Appearance**

Compared to open wire, closely spaced conductors present a neat, compact arrangement that improves appearance wherever it is installed. Close 6-inch spacing also improves system electrical characteristics . . . permits easy phase identification and proper load balancing. Usual installation practice is approximately 35 spacers per 1000 feet.

WITH its unique new spacer design, KW now offers you unsurpassed dependability and handling ease for cable systems operating at 5 to 15 kv, by using only one spacer for the whole range of voltages.

No tools or tightening necessary: entire spacer system snaps in and locks.

The system consists of four parts: (1) Phase conductors (EC grade aluminum, minimum conductivity 62 per cent, insulated with Polyethylene or Butyl rubber with Neoprene jacket); (2) Special high-strength messenger; (3) Molded one-piece spacers; (4) Molded Neoprene cable-retaining grommets.

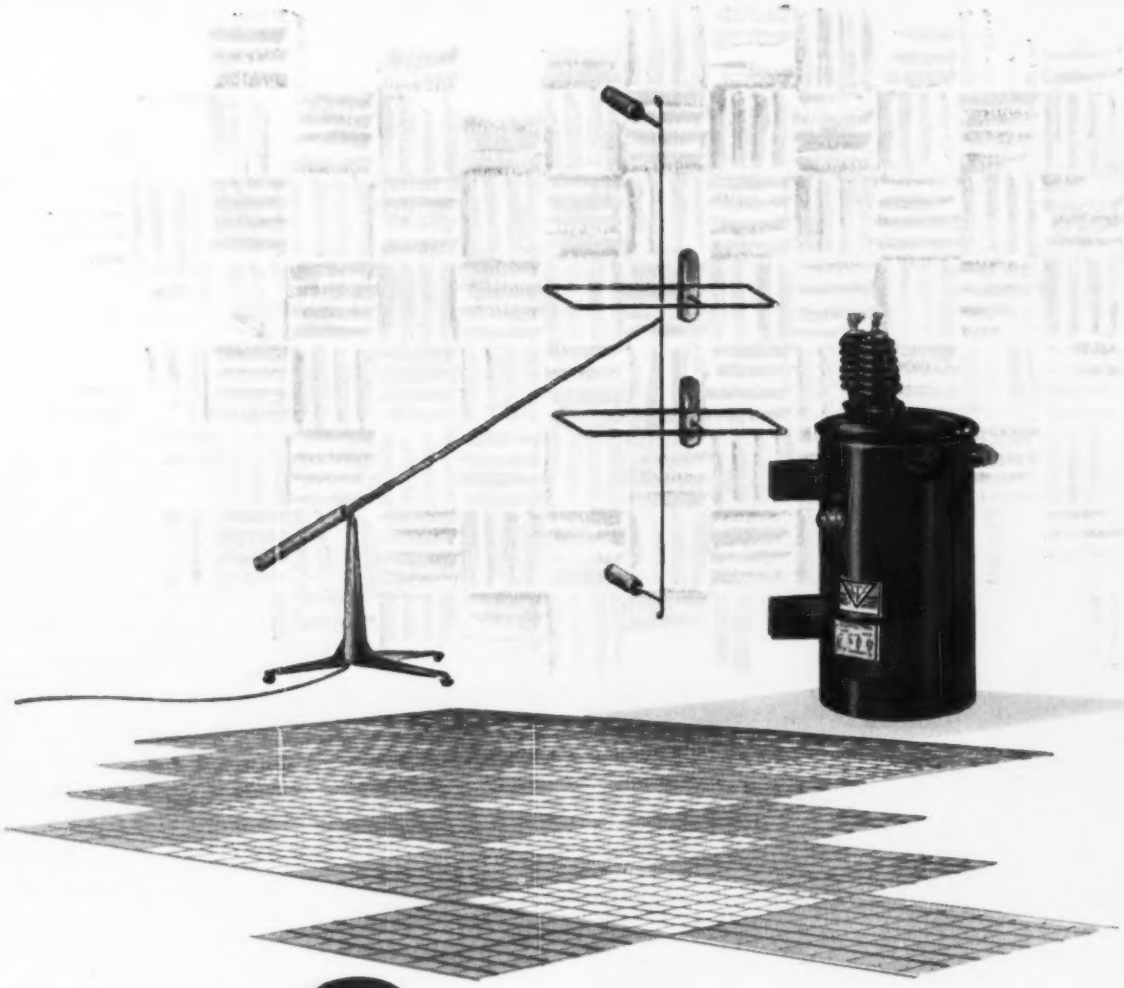
Standard hardware is available from leading suppliers. Call your Kaiser Aluminum sales office or KW distributor for immediate service and full information.

Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.

KAISER ALUMINUM

*"IF IT CARRIES CURRENT, KW CARRIES IT!"*

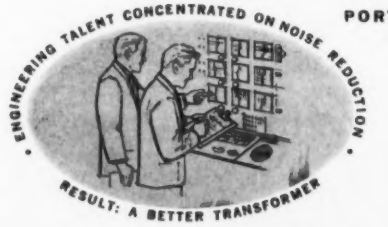
See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult your local TV listing.



**QUIET** transformers assure satisfied customers. More-than-ordinary quietness is another outstanding feature of RT&E transformers. Normal noise is hushed, for full transformer life, by a unique core-clamping method that isolates the core and minimizes the transmission of sound vibration to the tank. By this method, operating noise is reduced to a point far below maximum db levels being considered by NEMA as standard for distribution transformers.

More proof that you buy more than just another transformer when you buy from RT&E.

**RT&E CORPORATION**
WAUKESHA, WISCONSIN
PORTLAND, OREGON

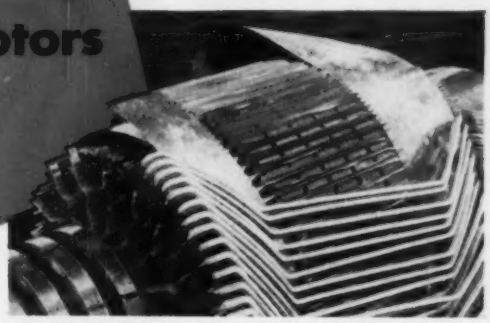



FF

Winders starting a coil in a Westinghouse 500 KW, 600 volt, 1200 RPM Rotary Converter Armature.

# WEST VIRGINIA ARMATURE CO. USES NATVAR ABOGLAS® in Rewinding Heavy Duty Mine Motors

Because of its flexibility, Aboglas is easy to handle, and its mechanical and electrical properties are excellent. Aboglas is being used here, not only to separate the end turns, but also as a separater between the top and bottom coils in the slot portion of the armature.



Aboglas easily adapts itself to the contour of a large armature. This ability to conform to irregular surfaces, plus high mechanical and electrical strength makes it popular for important rewind jobs.

West Virginia Armature Co., with main plant in Bluefield, and five branch plants in other important coal mining areas, has built an excellent reputation for Service since its founding in 1909.

This Company has been using Aboglas for some time as shown in the accompanying photos, and also as a separator between the shunt and series sections of compound field coils.

Aboglas, a composite consisting of a layer of varnish saturated asbestos paper sandwiched between two layers of varnished open-weave Fiberglas*, is only one of the Natvar insulations developed to do a specific job, and do it well. If you are using flexible electrical insulations, it will pay you to investigate the Natvar line. You can depend on their uniformly high quality, and you can get them either from your own wholesaler or direct from us.

## Natvar Products

- Varnished cambric—sheet and tape
- Varnished canvas and duck—sheet and tape
- Varnished silk and special rayon—sheet and tape
- Varnished papers—rope and kraft—sheet and tape
- Varnished, silicone varnished and silicone rubber coated Fiberglas*—sheet and tape
- Slot cell combinations, Aboglas®
- Isoglas® sheet and tape
- Isolastane® sheet, tape, tubing and sleeving
- Vinyl coated and silicone rubber coated Fiberglas tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

*T.M. (Reg. U.S. Pat. Off.) OCF Corp.

*We will be very happy to supply information on any of our products on request.*

**NATVAR CORPORATION**

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

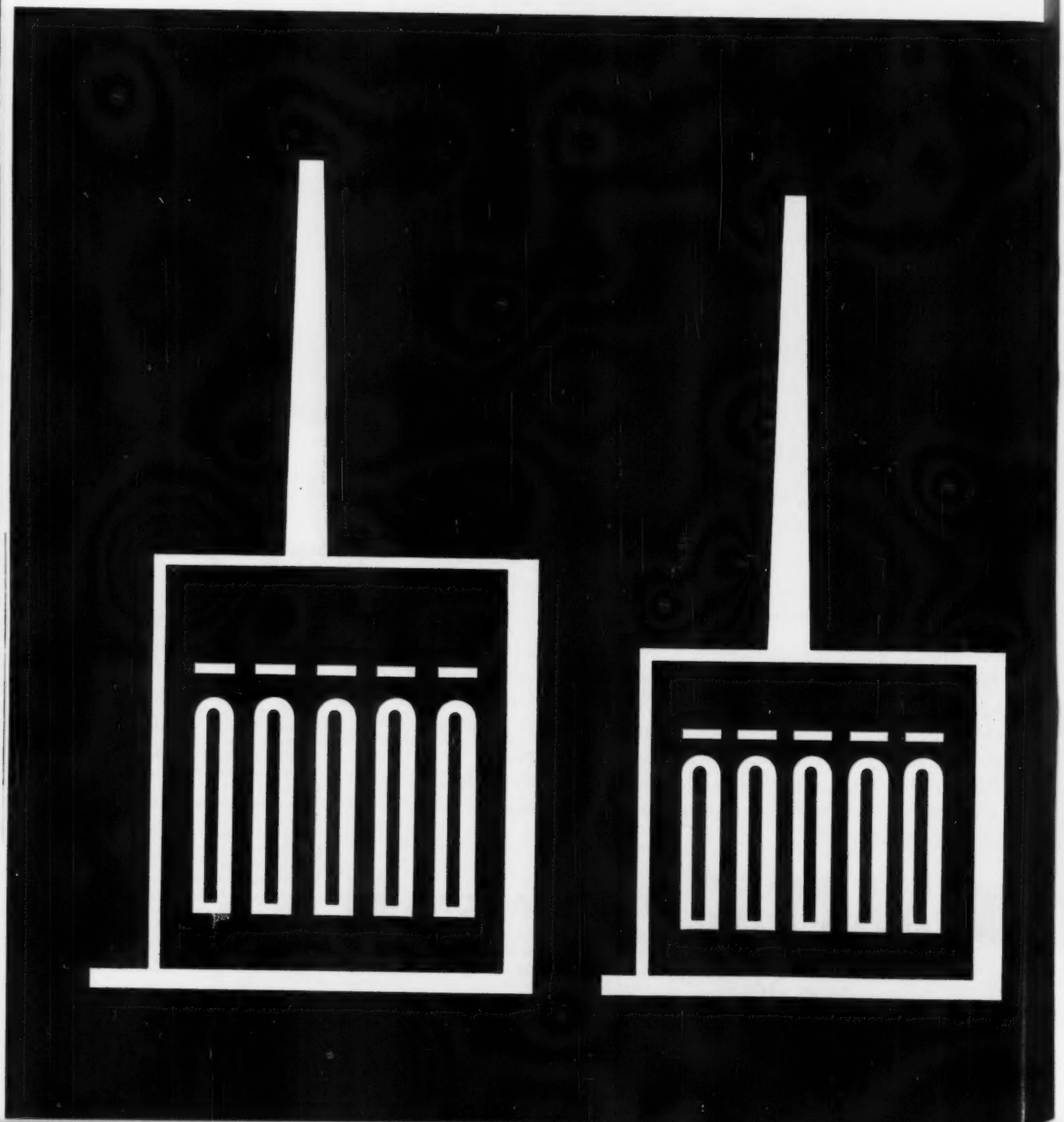
TELEPHONE FULTON 8-8800

CABLE ADDRESS NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY

*Gas Tempering:* **Report No. 3**

# Electric Utilities Cut Costs With



# Over-All Plant Gas Tempering

## ...Smaller Buildings Per KW
## ...Less Structural Steel
## ...Lighter Foundations
## ...Shorter Steam Leads

Historically, the size of steam generating equipment has been based on two main considerations: space needed to burn fuel, and surface required to cool gases before they reach the convection surface. Boiler designers have long known that to cool the gases, they had to use furnaces much larger than required if complete combustion of the fuel were the only consideration. Now with the proved-in-operation principle of Gas Tempering, the surface requirements to cool furnace exit gases are substantially less.

**What is Gas Tempering?** . . . it is the reintroduction of cool flue gases near the furnace outlet to control the temperature of the furnace gases entering the convection surface.

**From The Foundation Up,** Electric Utilities are finding B&W Gas Tempering the most effective method of controlling temperatures of gases leaving the furnace . . . with a unit that is designed for minimum weight, height and bulk.

**Definitive Booklet:** If you'd like to learn more about the economies and design flexibility available to you through Gas Tempering, write for Bulletin G-96. Address: The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

### Major Advantages of B&W Gas Tempering

. . . It cuts overall plant costs because the smaller size unit requires a smaller building per kw, a lighter foundation, less structural steel and shorter steam leads.

. . . It enables you to utilize the most economical available fuels. It permits the burning of a variety of coals without slagging, minimizes external corrosion of superheater tubes, and assures safe metal temperature, thus prolonging tube life, regardless of the fuel fired.

. . . It provides safe superheater tube temperature by positive gas temperature control; it protects superheater during startup and under all operating conditions.

. . . It makes it safer to design for economies offered by operation at steam temperatures of 1050 F and above.

B&W

THE BABCOCK & WILCOX COMPANY

*BOILER DIVISION*

G-933

**if** *you have a cable problem...*

—and want Kerite insulation for a special application or unusual condition, you have only to lift the phone. Kerite specialists can show you cables for a wide variety of end uses and conditions.

Each combines Kerite insulation with outer coverings of the most advanced material and engineering. Each provides maximum service reliability and economy. And each has been *proved* on actual jobs.

As cable experts will confirm, no other cable can match this record of performance. We believe you will be impressed by the evidence.

**KERITE CABLE**

*Our headquarters is at 30 Church St., New York 7.*

DAYS KERITE

*it's the* **KERITE** *that makes the difference*

DEDICATED TO PROGRESS RIC WIRE

**BRANCHES IN**
Ardmore, Pa., Birmingham, Boston, Cleveland, Chicago, Houston, Portland, Ore., St. Louis, San Francisco, Glendale, Cal., Seattle

# Editorial Comment

SEPTEMBER 21, 1959

## "We Only Sell the Electricity"

New York City's current wave of juvenile crime has prompted emergency meetings of state and local authorities, and apparently has fostered a healthy increase in the city police force. One of the most vicious incidents took place at night in an unlighted city playground.

It took two lives.

There is absolutely no excuse for presenting our modern thugs, juvenile or otherwise, with the readymade opportunity afforded by naked darkness. Regardless of who should shoulder the blame for the shameful neglect of not blotting out the night, his negligence is the more shameful if he realizes what decent illumination can do to assist the keeping of the law.

We know with absolute certainty that crime rates can be cut drastically by proper street and area lighting.

Item: One national poll of police chiefs found that 75 percent of major street crimes such as rape and muggings occur under cover of darkness.

Item: Another countrywide poll of chiefs concluded that major crimes of violence are reduced over 50 percent by relighting with modern techniques and equipment.

Item: One chief in a large Southern city reported that after relighting, major crimes of violence fell 90 percent.

What can the utilities do? One thing, we know, they cannot do: they cannot shrug off the callousness of civic authorities with a complaisant "We only sell the electricity."

Utilities increasingly pride themselves on the part they take in civic activities. To be really proud, they must arm their street lighting specialists, not only with the best technical data, but with the latest available statistics of the type cited above. It must be their mission to pound on doors, hammer on tables, and raise the roof—and not stop until they get the message across.

We know of no other area of public relations where the electric utilities can make such a powerful contribution to public welfare.

## The Fuel Cell vs the Electric Storage Battery

Development of the fuel cell is proceeding rapidly. An assembly of the advanced Bacon cells (see p 76) already has put out 5 kw at up to 65% efficiency.

There is a race shaping up, with the fuel cell a strong contender. At contest is the future powering of truly portable equipment, now the province of the internal combustion engine. Another entry in the race is the familiar reversible-cycle electric storage battery.

If the automobile eventually goes electric, the fantastic energy now supplied at pitiful efficiencies by gasoline probably will be provided by the fuel cell or the storage battery.

The utilities have great interest in this race. If the nod goes to the storage battery, they stand to cash in on the tremendous off-peak load of night-time charging. But if the non-reversible fuel cell triumphs, the utilities won't get a smell of the energy business.

What is needed is a real push to the development of a better storage battery to wear the utility colors. We would think the power companies would eye the dope sheet and the odds, and aid in every way to encourage the development of their entry.

# Hot Weather Boosts Summer Pe

| Company | 1959 Summer Peak Load Kw | Increase Over 1958 Summer Peak Kw | % | % Over Predicted Summer Peak | % Over 1958-9 Winter Peak |
|---|---|---|---|---|---|
| Alabama Power Co | 1,712,900 | 69,500 | 4.2 | −6.3 | 13.9 |
| American Electric Power System | 4,285,000 | 426,000 | 11.0 | −4.8 | − 1.1 |
| Arizona Public Service Co | 605,500 | 56,700 | 10.3 | −0.2 | 67.7 |
| Arkansas Power & Light Co | 913,000 | 145,100 | 18.9 | 0.3 | 43.4 |
| Atlantic City Electric Co. | 332,200 | 38,000 | 12.9 | 6.1 | 19.2 |
| Baltimore Gas & Electric Co | 1,077,000 | 126,000 | 13.2 | −4.7 | 12.1 |
| Boston Edison Co | 863,300 | 92,800 | 12.0 | 3.4 | −5.7 |
| California Electric Power Co | 348,500 | 35,100 | 11.2 | −1.3 | 20.0 |
| Carolina Power & Light Co | 1,158,000 | 120,000 | 11.6 | 0.9 | 10.5 |
| Central Hudson Gas & Electric Corp | 215,000 | 19,100 | 19.7 | 3.9 | −8.4 |
| Central Maine Power Co | 371,000 | 26,700 | 7.9 | −4.6 | −4.4 |
| Central Vermont Public Service Corp | 103,900 | 14,000 | 15.6 | 1.4 | −6.2 |
| Cleveland Electric Illuminating Co | 1,422,000 | 210,000 | 17.3 | 6.5 | 6.1 |
| Commonwealth Edison Co | 4,233,000 | 329,000 | 8.4 | 1.3 | 3.2 |
| Connecticut Light & Power Co | 640,800 | 75,000 | 13.3 | 1.9 | −7.4 |
| Consolidated Edison Co | 3,955,000 | 455,000 | 13.0 | 4.1 | 12.5 |
| Consumers Power Co | 1,653,000 | 179,000 | 12.1 | −2.5 | −5.4 |
| Delaware Power & Light Co | 426,500 | 61,500 | 16.8 | 7.0 | 17.0 |
| Detroit Edison Co | 2,584,000 | 332,000 | 14.7 | 3.4 | −0.7 |
| Duke Power Co | 2,466,900 | 179,700 | 7.8 | −0.1 | 5.9 |
| Duquesne Light Co | 1,137,200 | 105,000 | 10.2 | 5.3 | 3.2 |
| EEI & OVEC | 2,813,000 | −48,000 | −1.7 | 0.0 | −3.2 |
| Florida Power Corp | 513,000 | 59,000 | 13.0 | 2.5 | −14.6 |
| Florida Power & Light Co | 1,167,000 | 76,000 | 7.0 | −4.6 | −6.9 |
| General Public Utilities | 1,884,200 | 197,100 | 11.7 | 3.2 | −2.1 |
| Georgia Power Co | 2,330,400 | 190,900 | 8.2 | 3.1 | 15.6 |
| Hartford Electric Light Co | 320,600 | 42,000 | 15.1 | 7.9 | −6.1 |
| Houston Lighting & Power Co | 1,681,800 | 90,000 | 5.6 | −3.3 | 55.0 |
| Idaho Power Co | 580,000 | 58,000 | 11.1 | 5.1 | 22.9 |
| Indianapolis Power & Light Co | 582,000 | 65,000 | 12.5 | −1.0 | 13.9 |
| Iowa Power & Light Co | 296,900 | 21,000 | 7.6 | −0.1 | 16.5 |
| Kansas City Power & Light Co | 676,500 | 19,600 | 3.0 | −7.3 | 35.2 |
| Kansas Gas & Electric Co | 508,400 | 55,100 | 12.2 | 1.7 | 40.2 |
| Long Island Lighting Co | 828,100 | 140,000 | 20.3 | 6.9 | −9.2 |
| Los Angeles Dept of Water & Power | 1,345,000 | 130,000 | 10.7 | 2.3 | −6.3 |
| Louisiana Power & Light Co | 472,000 | 25,000 | 5.6 | −5.6 | 32.2 |
| Mississippi Power Co | 287,100 | 23,700 | 9.0 | −2.8 | 45.2 |
| Mississippi Power & Light Co | 433,000 | 40,000 | 10.2 | 1.2 | 39.2 |
| Montana Power Co | 472,000 | 16,000 | 3.5 | 0.4 | −8.4 |
| New England Electric System | 1,184,000 | 81,000 | 7.3 | 2.3 | −9.6 |
| New Orleans Public Service Co | 380,000 | 15,000 | 4.1 | −5.0 | 63.1 |
| N Y State Electric & Gas Corp | 701,000 | 74,500 | 11.9 | 4.6 | −9.7 |
| Niagara Mohawk Power Corp | 2,576,800 | 203,600 | 8.6 | −3.5 | −9.1 |
| Northern States Power Co | 1,287,500 | 117,200 | 10.0 | −1.5 | −0.2 |
| Ohio Edison System | 1,546,900 | 174,600 | 12.7 | 0.4 | −0.6 |
| Oklahoma Gas & Electric Co | 790,500 | 77,400 | 10.8 | −6.5 | 52.5 |
| Pacific Gas & Electric Co | 4,564,900 | 545,700 | 13.6 | 1.5 | 11.0 |
| Pacific Power & Light Co | 773,400 | 68,400 | 9.7 | −3.0 | −18.4 |
| Pennsylvania Power & Light Co | 1,324,000 | 101,000 | 8.3 | −1.1 | 1.5 |
| Philadelphia Electric Co | 2,543,000 | 338,000 | 15.3 | 3.4 | 10.3 |
| Portland General Electric Co | 661,000 | 46,000 | 7.5 | 0.6 | −21.8 |
| Potomac Electric Power Co | 1,091,000 | 124,000 | 12.8 | 9.1 | 45.0 |
| Public Service Co of Colorado | 530,700 | 61,700 | 13.2 | 0.5 | −5.1 |
| Public Service Co of N H | 287,700 | 32,500 | 12.7 | 1.3 | −2.8 |
| Public Service Co of N M | 164,000 | 33,100 | 25.3 | 0.0 | 24.9 |
| Public Service Electric & Gas Co | 2,583,000 | 325,000 | 14.4 | −0.6 | 9.9 |
| Puget Sound Power & Light Co | 479,000 | 70,600 | 17.3 | −1.2 | −23.6 |
| Seattle City Department of Lighting | 633,000 | 67,000 | 11.8 | −4.5 | −23.7 |
| Southern California Edison Co | 2,959,000 | 300,000 | 11.3 | 0.3 | −0.1 |
| Southwestern Public Service Co | 729,900 | 74,200 | 11.3 | 5.0 | 34.1 |
| Tennessee Valley Authority | 7,942,000 | 640,000 | 8.8 | −0.1 | −15.3 |
| Union Electric Co | 1,756,000 | 232,000 | 15.2 | 3.4 | 29.5 |
| Utah Power & Light Co | 607,900 | 83,800 | 16.0 | 0.6 | 9.1 |
| Virginia Electric & Power Co | 1,167,000 | 178,000 | 12.4 | 3.6 | 13.2 |
| Washington Water Power Co | 476,000 | 26,000 | 5.8 | −0.6 | −20.8 |
| West Penn Electric System | 1,600,000 | 160,000 | 11.1 | 0.0 | −1.9 |
| Western Massachusetts Electric Co | 254,600 | 24,800 | 10.8 | 0.0 | −2.6 |
| Wisconsin Electric Power Co | 1,094,800 | 112,300 | 11.4 | 6.0 | 0.6 |
| | 90,383,300 | 8,683,000 | 10.6 | 0.4 | |

**Air conditioning load accelerates trend to summer peak. Industrial levels are much improved over 1958**

Many of the nation's utilities hit record high peak load figures in 1959, and all improved on their 1958 performances. Hot weather contributed heavily to the load in most sections of the country. Peaks rose 10.5%, compared with only 1.2% in recession-bound 1958. The corresponding figures for 1956 and 1957 are 9.2% and 7.3%.

The long steel strike has kept peaks from vaulting still higher, many companies noted. Some managed to chalk up record highs despite a load reduction due to the strike, while others set their highest marks in June before the strike began.

An informal survey by Electrical World shows that 96 Class I utilities reported peaks aggregating 90,383,300 kw. These companies operate at least 70% of the installed capacity in the country.

Increased air conditioner usage, cited by many, means that temperature and humidity conditions will have stronger effects on future system peaks. As most peak estimates are based on average temperature, the generally warm summer found 60% of the reporting companies exceeding estimates made at various times prior to the peak date.

### August Peaks Most Common

About half of the peaks occurred in August, with the week of Aug. 24-28 accounting for a large number of them. However, a dozen peaked in June and 20 more in July. Seven Northeastern utilities did not reach peak levels until September. These included the large systems of Consolidated Edison Co of New York, Public Service Electric & Gas Co in New Jersey, and Boston Edison Co.

Except for the steel strike, marked improvement in business activity was generally observed. Nearly all phases of industrial and commercial operations showed improvement.

# r Peaks Despite Steel Strike

Recovery in the textile and chemical industries were specifically cited. Although the non-ferrous metal industry continued weak, it was generally felt that this sector of business is back on the long-term growth line interrupted by the past recession.

An increase in agricultural activity and the attendant rise in irrigation pumping helped several utilities. A season of fairly light rainfall and good ground water conditions boosted pumping considerably.

Not all of the country found temperatures soaring, though. Utilities in Louisiana, Texas and Oklahoma said that a cool and rainy summer had kept peaks below estimates.

A period of several days of hot and humid weather is more likely to produce a peak than a single scorcher. The peak for a number of companies occurred during a summer thundershower that climaxed a hot, humid period.

### Strike Causes June Peaks

Large systems whose load is affected by the steel situation usually peaked in June. These included Cleveland Electric Illuminating Co, Duquesne Light Co, Philadelphia Electric Co and Baltimore Gas & Electric Co. Some companies that had August peaks believe that even higher figures would have been recorded if steel production had been normal.

Commonwealth Edison Co said that its August 25 peak would have been about 200,000 kw higher if there had not been a steel strike. Alabama Power Co's peak was 125,000 kw below expectations. The combination of the strike and cool weather cut Houston Lighting & Power Co's peak by an estimated 60,000 kw.

The steel strike whittled New England Electric System's peak about 17,000 kw, while Niagara Mohawk Power Corp's maximum summer demand was reduced by about 170,000 kw. Pacific Gas & Electric Co was down about 50,000 kw because of the walkout's impact.

The trend to summer peaking continues unabated in nearly all sections of the country. Although over 60% of the nation's utilities consider themselves winter-peak systems, 54% reported summer peaks higher than those recorded last winter.

Commonwealth Edison Co feels that it is in a transitional stage from winter to summer peaks. Public Service Electric & Gas will make estimates on the basis of summer peak loads for at least the next ten years.

Los Angeles Dept of Water & Power expects that it will become a summer peaking system by about 1970.

Companies listed as winter peak systems who had 1959 summer peaks higher than those of last winter include Central Hudson Gas & Electric Corp, Cleveland Electric Illuminating Co, Duke Power Co, Duquesne Light Co, Pennsylvania Power & Light Co, Utah Power & Light Co, and Wisconsin Electric Power Co.

## Air Conditioning Sales Head for Record

With utility peak loads hitting new highs this year (see above) many utilities give the credit to an increased use of air conditioning. And many air conditioning manufacturers are predicting a record year in 1959 for sales.

Retail sales of room air conditioners are expected to reach 1,750,000 units, a 400,000 jump from last year's estimated 1,350,000 units sold. An estimated 1,500,000 units were sold both in 1956 and 1957.

Manufacturers' sales, another barometer by which the success of the air conditioning business is measured, are shown in the table below.

Still another measurement is dealer inventory, the number of units dealers have on hand after the prime selling season has passed. An end-of-the-summer survey by *The Wall Street Journal* has found air conditioning dealers with the lowest inventories in years.

The best sales month for the country over-all is usually the month of June. Last year, manufacturer sales of room air conditioners totalled 251,000; residential packaged units, 19,600; and commercial packaged units, 12,300, for a 282,900 total. This year, 26,800 residential packaged units were sold in June, while 17,200 commercial packaged units were sold. Both of these figures were monthly highs for this year. (Room air conditioning sales for this June were not available.)

Reasons advanced for the large sales of air conditioners this year include:

- An unusually hot summer in many parts of the country.
- An upcoming Federal excise tax which will tack 10% on room units of less than 1 hp.
- A concentrated air conditioning campaign, "Beat The Heat," by the National Electrical Manufacturers Assn.

As for next year, one industry spokesman thinks production may hit 1.6 million, up from this year's 1.4. But it may go as high as 1.8 million, he said.

### Manufacturers' Sales of Air Conditioners

| | Room Air Conditioners | Residential Packaged Units | Commercial Packaged Units | Totals |
|---|---|---|---|---|
| 1956 | 1,828,365 | 132,300 | 122,100 | 2,082,765 |
| 1957 | 1,586,094 | 126,200 | 88,500 | 1,800,794 |
| 1958 | 1,600,000 | 137,600 | 86,700 | 1,824,300 |
| 1959* | 971,000 | 114,400 | 73,300 | 1,158,700 |

* First six months

# Talks Begin on East Coast Coal Pipeline

**If okayed, 24-in. line could carry up to 12-million tons a year to four prospective utility customers**

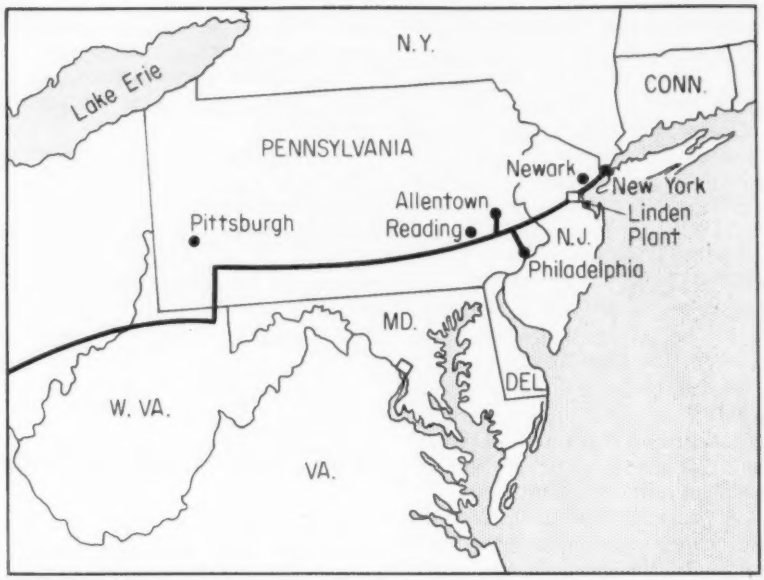
The stiffening battle against rising fuel transportation costs has led to exploratory negotiotions for a big coal pipeline running some 290 miles from West Virginia to the East Coast. The proposed link would have an estimated capacity of from ten to 12-million tons of coal per year if a 24-in. line proves economically feasible.

Based on 1958 fuel consumption figures this capacity would supply nearly all of the combined coal requirements for the four electric utility companies who are prospective customers for the line's slurry.

These companies are Consolidated Edison Co of New York, Public Service Electric & Gas Co in New Jersey, Pennsylvania Power & Light Co of Allentown, and Philadelphia Electric Co. Their coal consumption last year aggregated 13.4-million tons.

Pittsburgh Consolidation Coal Co initiated the discussions. It would supply the fuel from the rich bituminous fields it owns in West Virginia. A spokesman for the company emphasized that the project was in early exploratory stages, and that it would be premature to conclude the pipeline was set to go.

The pipeline would be built and operated by Texas Eastern Transmission Corp, a natural gas transporter with an existing gas line that adjoins the coal field area and runs to New York City. Its ownership of the right of way permits construction of another line without the time consuming acquisition of additional land rights.




**PIPELINE ROUTE** could parallel existing gas transmission line, shown above, that Texas Eastern owns, operates. It is about 290 miles from mines to New York

### 'Show Us,' Say Utilities

Spokesmen for the utilities echoed the cautious tone of Pitt Consol's comments on the project. Con Edison's view is "that we are not fully aware of the economic feasibility of the pipeline scheme, nor of what other problems—rates, FPC regulations, and others—are involved . . . We are merely saying: 'Show us, and we'll listen'."

Public Service E&G "would be interested if it actually proves feasible," but is withholding any decision until engineering studies are made, a spokesman said. The same opinion exists at Pennsylvania P&L where "we would definitely be interested" if the studies prove out.

A Philadelphia Electric vice president said his company "is interested in any development in the transportation of fuel and, therefore, is interested in the coal pipeline plan." The proposal has to be studied long and thoroughly since it is in "an embryonic stage and there are no statistics locally to compare costs of transporting coal by this method with conventional means now used."

### CEI Success a Factor

One factor in favor of a definite agreement is the success to date of Cleveland Electric Illuminating Co's 108-mile coal pipeline from Cadiz, Ohio to the utility's Eastlake Plant. This line taps Pitt Consol's big mines in Georgetown Ohio, and can transport up to 1.4-million tons a year, enough to supply 80% of the coal used at the plant. The $12.5-million project began operating in 1958.

The resultant savings in transportation costs helped cut CEI's fuel cost per million Btu from 28.55¢ in 1957 to 28.51¢ last year.

In the CEI pipeline operation fuel is pumped in a coal-water slurry from the Cadiz preparation plant to the generating station where it is dewatered and dried. Three pumping stations along the route keep the slurry moving for the 30 hours required to move the coal the 108-mile distance. Use factor for the system is about 90%.

The coal company said the proposed pipeline's size depends on engineering studies as well as the total market. Sizes of up to 30-in. are technically feasible for coal slurry transport.

### Network Not Expected

A Pitt Consol representative pointed out that coal pipeline projects require a rich source of coal, assured outlets for a large amount of the fuel over a long period, ample water for the slurry preparation, and the absence of any complex right of way and construction problems.

Because of these requirements, "there won't be a gigantic complex of coal pipelines in the U. S.," he said.

# TVA 'Containment' Eases Some Worries

**Although not happy with measure, power companies say it sets area limits for first time; may lead to power pool arrangement**

**ANALYSTS' MEETING** featured Harllee Branch, right. Philip Sporn, center, was guest; behind him is Analyst R. Murray

Although the Tennessee Valley Authority "self-financing" bill disappointed private power companies in the area, the measure for the first time sets a geographical limit on TVA's expansion. It also sets a precedent of containment of public power and means that the agency's rates now will have to reflect the costs of getting money on the open market.

This was the consensus of top executives from some of the area's private utilities in a session with New York Security Analysts Aug. 27. The bill was described as "fairly reasonable in its approach," and a "substantial contribution" to improvement of the 26-year-old encroachment threat.

TVA's rates may be adjusted to reflect the results of revenue bond financing and of amortization requirements, the analysts were told. Because of this factor and the area limitation, a closer study of power pool agreements with TVA becomes a possibility.

The company executives included Harllee Branch, Jr, Southern Co president; Philip Sporn, American Electric Power Co president; Donald Cook, executive vice president of AEP Service Corp; and Donald Winfield, Middle South Utilities Co treasurer.

Branch, the main speaker, warned that the TVA bill diminishes Congressional and Executive responsibility for federal agencies, encourages fiscal and budgetary irresponsibility, and conceals from the public TVA's continued dependence on subsidies.

### 'Self-Financing' Term Is 'Illusory:' Branch

The term "self financing" is "illusory," Branch declared. TVA will get a $468-million "gift" from taxpayers by retaining the accumulated net income on past power operations. As for $1 billion of prior appropriations, TVA will amortize the principal for a period almost twice as long as a power company could, and it will pay only the average interest rate which the U. S. pays on all outstanding long and short-term marketable debt, Branch said.

He emphasized that the bill does not limit TVA strictly to revenue bond financing. "The agency can still go to Congress for appropriations."

The bill's provisions on control of TVA financing still are generating confusion, Branch said. Some say the wording requires the same notification procedure to the President and Congress that existed beforehand. Others believe it relieves TVA of all responsibility to inform anyone of its plans. The TVA board of directors will not change its past approach of notifying in advance, according to information he has, said Branch. It may, however, take a court test or new laws to clear up the questions.

Branch explained that companies in the region made a realistic acceptance of facts, not a compromise, last year that some form of bond-financing bill would be adopted in 1959. Legislators—many of them TVA supporters—recognized the danger to the companies' investors and wrote in the area limitation clause.

"We recognize this limitation . . . could be changed," Branch said. "However, I can't believe that the reassurances granted by Congress . . . will be altered or withdrawn. . . ."

### Change in TVA Rate Structure Possible

In answer to one analyst's question, Winfield said TVA "might very well have to do something with the rate structure," depending on results of its bond financing and amortization. "When it will happen, I cannot judge," he added.

There has been hesitation "on both sides" in studying the feasibility of a power pool agreement with TVA, said Sporn. The bond bill "certainly opens possibilities," ones which "I hope will be explored." If a pool permitted AEP to postpone a 450-Mw unit one year, it would save $9 million in fixed charges, he said.

In the view of AEP's Cook, the legislation does establish one precedent—containment of public power. This is predicated on the certainty in 1958 that some form of bond bill would pass. He said that TVA's role as sole supplier of power makes for a "differentiation" between the agency and other public power groups in the U. S. that are intermixed with private utilities.

When asked if towns outside TVA's area could hold referendums seeking power from the agency, Branch replied that the only avenue for outside communities is Congressional authorization.

The TVA bill enables the agency to obtain $750 million in revenue bonds to finance power projects. Branch estimated this amount would cover TVA's needs for five years.

# The Powerscope

## TVA Bid Hearing Set

Sen Estes Kefauver's hearing into identical bids, received by the Tennessee Valley Authority from major U. S. electrical equipment suppliers, will be held Sept. 28-30 in Knoxville.

Kefauver, chairman of the Senate Antitrust & Monopoly subcommittee, is the only senator certain to be present, although other committee members may attend.

Witnesses will be limited to the TVA purchasing department and to spokesmen for five Tennessee and Kentucky cities, because of the mass of testimony the committee expects to collect. No manufacturing firms will be asked to supply witnesses.

TVA will be asked to submit its three-year study of identical bids on various invitations, and the cities are expected to produce evidence that they have received similar identical bids. No report will be issued after hearings, as Kefauver considers this only one phase of a "bigger problem" involving what he calls "administered prices." Next committee target is expected to be the Defense Department.

## 1958 Revenues Rose 5.4%

Total operating revenues of the nation's private power companies reached $10,194,819,000 during calendar 1958, up 5.4% over the previous year, the Federal Power Commission has announced.

Net income climbed by a slightly faster 7.5% during 1958 to reach $1,518,823,000.

Total assets of all companies in 1958 reached $39,384,435,000 compared with $36,497,588,000 in 1957; net investment in utility plant was $35,282,064,000 vs $32,421,-133,000 in '57; dividend appropriations totaled $1,133,942,000 vs $1,069,131,000. Ratio of long-term debt to total capitalization was 52.7%—35.9% of common stock equity.

## No Texas R/W Decision

The Texas Supreme Court recessed until Oct. 1 without acting on the state's appeal from adverse lower court decisions on who shall pay for relocating utilities along interstate right-of-way. Test cases were brought by electric utility, telephone and gas companies, as well as by the cities of Austin and Dallas.

The state contends that using federal-state funds to pay for relocating privately owned utilities violates the state constitution, even though the legislature authorizes such payment.

Construction is presently proceeding on the interstate program with the understanding that the utilities relocation ultimately will be financed by the litigation losers.

## Stinson Car Stalls

Stinson Aircraft Tool & Engineering Co—its production line stilled—is seeking a new way to resume manufacture of the Charles Town About electric car. If merger with an auto manufacturer does not go through, Stinson officials hope to incorporate and manufacture most of the car in Japan.

The merger or the reorganization will mean a one-year delay in filling orders for 110 U. S. utilities and other firms.

High vendor costs for equipment and the components caused the shutdown. Domestic battery and motor makers would probably continue to supply these components if the reorganization is made.

The new corporation plans include capitalization for $10 million and issuance of $2 million in stock sometime after the first of the year. Before production stalled, Stinson completed about four cars, one of which is undergoing modifications and tests at Atlantic City Electric Co.

Bayard England, ACE board chairman, is not discouraged by the turn of events. He points to nearly a dozen other firms now under way or planning electric vehicle production as evidence of the electric's promise.

Among these firms, Nu-Way Industries, Inc, of Lansing, Mich., still plans to have a 1960 model on the market, although it is not yet taking orders. Price of the car is estimated at from $2,000 to $2,200, which is several hundred dollars higher than previous target prices.

Steven Kish, Nu-Way president, says "We're not thinking about a merger with Stinson. It's been talked about, that's all. We feel we can come up with the answer we need ourselves. But anything could happen."

Electricar Mfg Corp is proceeding with designs and research at its Freeport, Long Island, N. Y. plant but is withholding any promotion or publicity until its car is ready to roll.

A car is still in the works at Cleveland Vehicle Co but emphasis to date has been on production of 50 electric trucks plus development of a prototype high-volume electric van. The van model will have 2,500-lb capacity, 375 cu ft of space, 30-35-mph speed, and 75-mi range. A 44-cell Exide lead acid battery with 550-amp/hr capacity will power the vehicle, which is aimed for bread and dairy operations. Another model is undergoing test in various parts of the U. S. by the Post Office Department.

## Ellis Challenged

Clyde Ellis, National Rural Electric Cooperative Assn general manager, was challenged last week by Rep Richard Simpson (R-Pa.) to deny rumors that some NRECA employees will campaign for Democrats.

To encourage such activities, Simpson said in a letter to Ellis, "would . . . necessitate your forfeiting the position of being a non-political . . . organization."

Simpson referred to "sufficiently well founded rumors" that Ellis plans to "'loan' some of your (NRECA) employees to Democrat candidates for Congress to serve as campaign counselors or managers with the understanding they will be re-employed by you after the elections are over."

"Such a practice," Simpson said, "would be tantamount . . . to putting your organization directly into political activity . . ." He added that Ellis' own comments at meetings had aroused complaints from Congressmen and REA subscribers who resented political ax grinding.

# 34.5-Kv Industrial Distribution Combines Reliability and Economy

**R. H. RENCKEN,** Electrical Division Head, Scientific Design Co, Inc, N. Y., N. Y.

Selection of a 34.5-kv primary distribution system for a new chemical plant produced savings of over $200,000 in initial capital investment. Serving an initial load of 15 Mva that may eventually grow to over 100 Mva, the design provides ample flexability for expansion but does not require large investments for loads that may not materialize. The design also:

- Holds voltage dip on the 4-kv secondary distribution system to within 5% under the most severe operating conditions;
- Limits short circuit duty on the 480-v circuits to 15,000 amp, to permit use of standard components in the motor control centers and keep the installation in economic balance.
- Assures maximum service continuity to critical processes by stressing simplicity and selectivity.
- Permits later expansions to be tied into the system with only one short power interruption.

The unusually high primary distribution voltage was selected after a comprehensive economic and engineering comparison of both 34.5 and 13.8-kv distribution systems. A single line diagram of the system is shown in Fig 1.

Since the chemical plant was located at a new site, no existing facilities had to be considered in designing the system. The site was divided into several manufacturing areas, one for the initial installation, the other for future additions. Each subdivision would have about 15-Mva capacity and include a few large motors, 200 to 3,000 hp, and a larger number of smaller motors. Each area will have a separate 15-Mva substation, with its own metering. This simplifies computation of costs in any area for operating and accounting purposes.

As each expansion is added, the savings in investment will snowball. When the plant is completely expanded, savings should be approximately $1 million.

The initial installation is served by two 34.5 kv, 3-wire power company feeders. Two additional feeders will be installed when the other manufacturing areas are added. The first two feeders have an available symmetrical 3-phase short circuit duty of 250 Mva. Although they originate in a common generating station, they have different routing to the plant. The feeders are bare copper wire, with static line, supported by standard wood pole construction.

At the beginning of the study it was apparent that the primary distribution voltage would have to be 13.8 kv or higher, because of the high currents and the long distance over which the system had to run. The only common distribution voltage between 13.8 kv, the lowest practical voltage, and 34.5 kv, the utility supply voltage, was 24 kv. Since equipment costs for 24-kv service are comparable to those for 34.5-kv, it appeared that the most of the advantages obtained by using

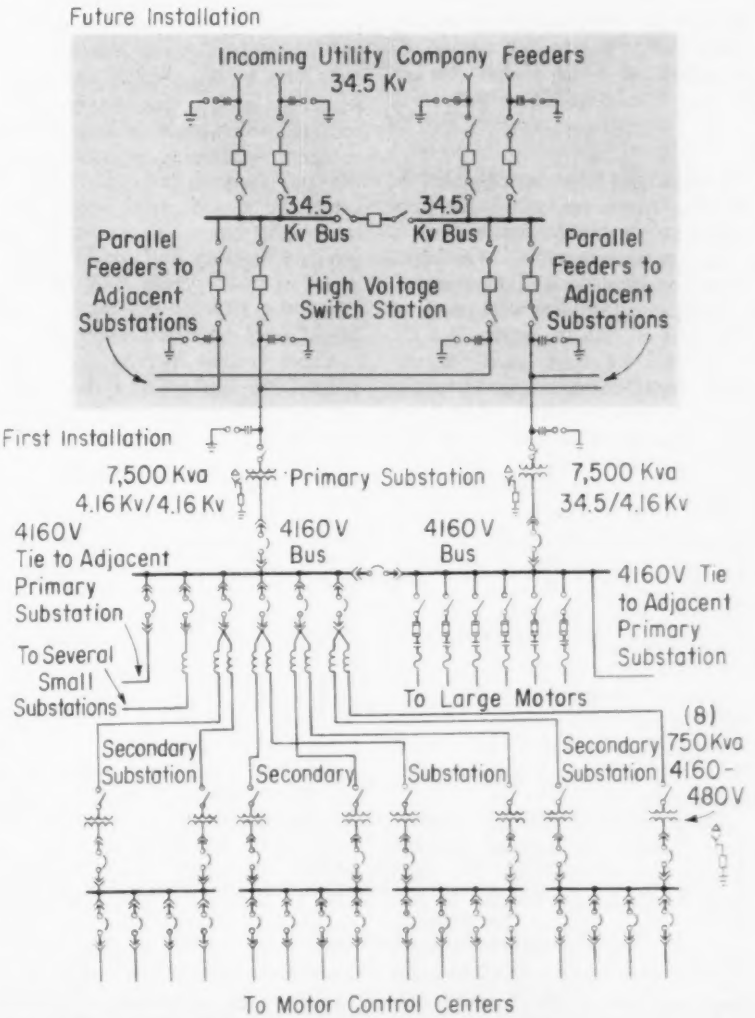



**FIG 1. SERVICE CONTINUITY** is provided by 4-kv tie breakers within each area, tie cables between areas. Either transformer can carry essential area load

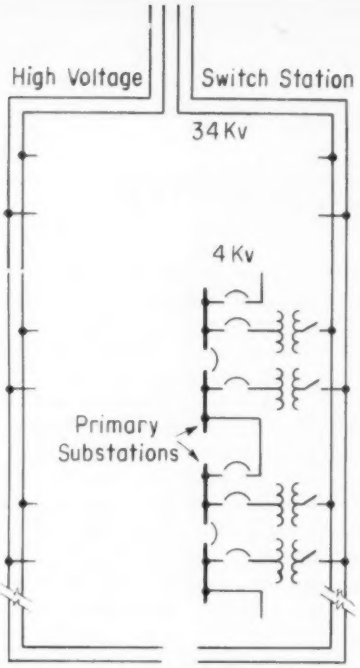



**FIG 2. HIGH VOLTAGE SWITCH STATION** and 34.5-kv feeders around site periphery will be built when first additional 15-kv area is installed

24 kv would also be obtained at 34 kv. Moreover, if 24 kv were used for primary distribution, a main substation for 34.5/24-kv transformation would be needed. Consequently, studies were made on the basis of 13.8 kv versus 34.5 kv.

If 34.5 kv were used for primary distribution, a secondary distribution system would be required for operation of large motors. On the other hand, if a 13.8-kv primary was used, it might be economical to operate large motors directly at that voltage. Normally, we service motors up to 200 hp at 480 v.

The first step was to select a service voltage for the large motors, since this decision would seriously affect the study for the primary distribution system. Motors in the 250-to 3,000-hp range are far more economical when operated at 4 kv. Motors for 13.8-kv are minimum priced at 1,000 hp.

Since most of the large motors were likely to be between 250 and 1,000 hp, 4 kv was the more economical voltage for this service. For example, one of the 3,000-hp motors would cost $20,000 more at 13.8 kv than at 4.16 kv. In addition, the cost of the 13.8-kv control equipment would be considerably higher.

Because of the large number of motors involved, using 4-kv voltage for the larger motors would save over $100,000 in motor cost, in addition to substantial savings in control equipment and cable. Thus the primary distribution voltage study was predicated on the use of a 4-kv secondary voltage.

The comparison of 13.8-kv and 34.5-kv distribution system was then made. Transformers with 34.5-kv primaries cost almost the same for either 13.8 or 4.16 kv secondaries.

If possible, we prefer not to locate distribution equipment and cable rated above 5 kv in plant areas. High voltage cables, either underground or exposed, can be dangerous to operating and maintenance personnel. These hazards are inherent in the conventional maintenance and expansion practices involving frequent excavation and use of long boom cranes.

If 34.5 kv distribution was used, we would need several smaller substations, which could be located one in each plant area, in accordance with our design criteria. If 13.8 was used, we would need fewer and large substations. These would be grouped together and would be remote from the areas they served. Using the 13.8 kv distribution, we would need more and larger cables.

Cable studies included both insulated, self-supporting aerial cables and bare copper cable, with suspension insulators, for each voltage.

### Cable Choice Saves $100,000

Cost of insulated 34.5-kv aerial cable was found to be one-third the cost of insulated 13.8 cable, with a dollar difference of $70,000. The cost ratio of 34.5-kv bare cable to 34.5-kv insulated copper cable was 1:8, representing a dollar difference of $38,000. Thus the total savings by using bare 34.5-kv distribution cable were over $100,000.

The cost comparison study made for the oil circuit breakers in the switchyard showed a savings of approximately $100,000 in favor of 34.5-kv equipment. Since 250-Mva, 13.8-kv breakers would not satisfy normal current requirements, 1,500-Mva breakers would have to be used if the distribution voltage was 13.8 kv. The difference in the cost of rupturing ratings made the 13.8-kv equipment prohibitively high.

From the above studies it was concluded that the optimum design would be a 34.5-kv primary distribution, with a 4,160-v secondary distribution in each plant area to serve large motors, and a 480-v system for small loads.

In the initial installation, only the portion of the system shown below the shaded area on Fig 1 is required. The 34.5-kv switch station will be installed at one end of the rectangular plant site when the first expansion is made. It will have complete flexibility. Since all motor starters have a time delay feature, the oil circuit breakers can switch the load without loss of service if one or more of the four planned power company feeders fail.

When additional manufacturing areas are built, the four 34.5-kv feeders will be routed around the property line, with two feeders running parallel around half the periphery and two serving the other half, as shown in Fig 2.

Each 15-Mva manufacturing area will be served by two 7,500-kva, 34.5/4.16-kv transformers, with 5-kv double-ended metal clad switchgear. With forced air cooling, either transformer can carry all the essential load in its area if necessary. Within each area, the two halves of the 4-kv bus are connected by a normally open tie breaker, which closes if either of the transformers or feeders fails.

As additional manufacturing areas are installed, underground 4-kv tie cables will be used to tie each end of the switchgear bus to the adjacent primary substations. These tie cables will be used if both transformers in one substation fail or if the one transformer is not capable of carrying the entire load of the substation. Thus the system is completely selective and can maintain service under double jeopardy.

The loads connected to the 4-kv switchgear bus are arranged so that one side of the bus serves all the large, 4-kv motors, while the other side feeds the secondary substations. Most of the large motors are located in the plant utilities area. Moreover, under some conditions it is possible to operate the plant process without operating utilities.

Since the calculated short circuit current on the 480-v buses was 43,000 amp, additional impedance

had to be added to limit the maximum short circuit current to 15,000 amp. This was accomplished by increasing the inductive impedance of the secondary substation transformers to 6% and adding current limiting reactors, rated 15%, to the 4-kv feeders serving the secondary substations. The short circuit calculation was based on the per cent impedance diagram shown in Fig 3. In evaluating other system impedances:

- The impedance of the 34.5/4-kv transformers and the system cabling was found to be 1% on a 1,500-kva base.
- Each pair of 750-kva, 4,160/480-v transformers was considered as one 1,500-kva bank with 6% impedance.
- Each reactor was rated 15% impedance.
- A 25% impedance was used as the average motor contribution on each substation.

Neglecting the 480-v line impedance, the total per cent impedance in the 480-v system was 11.2. Thus, the symmetrical short circuit current

$$I_{sc\sim} = \left[\frac{100}{11.2}\right]\left[\frac{1{,}500{,}000\ va}{(480\ v)\ (1.73)}\right]$$

$$= 16{,}100 \text{ amp}$$

The line impedance in the 480-v feeders reduced the 16,100 amp to approximately 15,000 amp at the motor control centers.

With the 15% reactor impedance added to the 7% impedance for the line and transformer, the effective system impedance was 22%. We then checked the voltage regulation to be sure we had not softened the 480-v system excessively.

Assuming an 80% power factor and a load of 1040 amp, or 863 kva for forced-air-cooled 750-kva transformers, the calculations were as follows:

$$\text{Cos } \theta = 0.8; \text{ Sin } \theta = 0.6$$
$$I \cos \theta = (1040)\ (0.8) = 832 \text{ amp}$$
$$I \sin \theta = (1040)\ (0.6) = 624 \text{ amp}$$

$$X_\Omega = \frac{(22)(0.480)^2\ (10)}{750} = 0.0666 \text{ ohms}$$

$$IZ = (I \cos \theta - jI \sin \theta)\ (R + jK)$$
$$= (832 - j\ 624)\ (o + j\ 0.0666)$$
$$= j\ 55 - j^2\ 42$$
$$V_{LN} = 277 - 42 - j\ 55$$
$$= 233 - j\ 55 = 239\ v$$

Then the voltage regulation,

$$= \frac{(277 - 239)\ (100)}{277} = 13.7\%$$

With 13.7% voltage regulation, we used the 5% above normal voltage taps on the transformers and arrived at a nominal system voltage of approximately 438 v.

Voltage regulation on the 4-kv system were calculated for the most severe conditions, which occurred as 3,000-hp motor was started. The motor manufacturer indicated that we would need a minimum of 60,000 kva symmetrical 3-phase short circuit at the motor terminals for a voltage dip of 15% at start and 8% at pull-in. Our standard practice limits starting dip to 10%.

With an available short circuit of 250 Mva on the primary side of the main substation transformers and a 6% transformer impedance, we calculated the available short circuit at the terminals of the 4-kv motors as follows:

$$I_{sc\sim} = \frac{(7{,}500 \text{ kva})\ (100)}{6} = 125 \text{ Mva}$$

Since the motor had a full load current of 323 amp and an inrush of 5.5 times full load at starting, the motor full load kva

$$= (323)\ (4160)\ (1.73) = 2320 \text{ kva}$$

and the % dip

$$= \frac{(100)\ (2.320 \text{ Mva})\ (5.5)}{(2.320 \text{ mva})\ (5.5) + (125 \text{ mva}_{sc}\text{v})} = 5\%$$

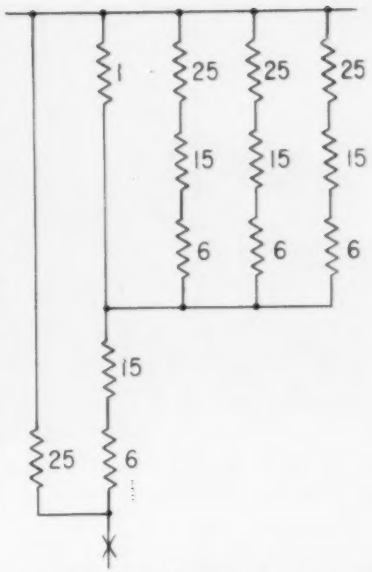



**FIG. 3. USING IMPEDANCES** above, 480-v SC current was 15,000 amp

Thus the voltage regulation on the 4-kv system would be 5% under the most severe condition. This is considered to be very good regulation for an industrial plant.

## Special Problems Emphasize Basic Design Concepts

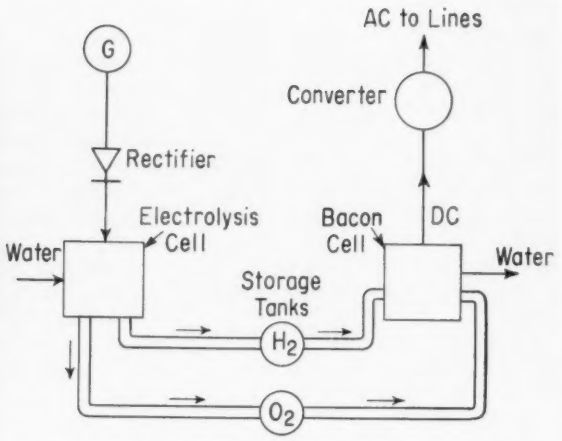
In many respects the design of this chemical plant distribution system involved unusual features. The primary distribution voltage selected is one of the highest ever used for this type of application, and was, in the early planning stages, the subject of considerable discussion.

Since the contemplated ultimate capacity was approximately eight times the initial installation, the initial capital investment for future expansion had to be weighed carefully. This was important both to minimize the investment and the interest involved, and also to protect the customer against the possibility that future expansion might not materialize due to business conditions. Lastly, the nature of the process was such that continuous service was very important and outages had to be kept to an absolute minimum.

However, the exceptional design requirements of this system only serve to further emphasize three basic principles which should be followed in designing any distribution system:

1. Long term planning is essential, both for workability and for economics. A moderate amount of flexibility built into a system from the start can later save money and eliminate difficulties.
2. Individual requirements, rather than conventional procedure should determine the distribution voltage. Accepting standard procedures and failing to explore all the possibilities can give way to wholesale waste.
3. Elaborate electrical systems are not always necessary and often defeat their purpose. In evaluating two designs for a given system, the simpler design is usually the best.

**BACON FUEL CELL HAS 5-KW OUTPUT** at 24 v, with water as byproduct. Free energy efficiency is 50% to 65%




**POSSIBLE OFF-PEAK POWER USE** electrolyzes water at night, reverses process in Bacon cells for daytime peaking

# Fuel Cell Reaches Practical Stage

## British development of automated hydrox cell may provide means to store off-peak energy for peaking service

A fully automated hydrox fuel cell that may eventually permit power stations to store off-peak energy was demonstrated to the public last month in a private laboratory at Cambridge, England. Known as the Bacon cell, it generates electricity directly — with water as a byproduct—by combining hydrogen and oxygen in a nickel electrode cell.

Maximum rated output of the unit demonstrated was 5 kw at 24 v or 2.5 kw at 32 v. The free energy efficiency of the process varies between 50% and 65%. The 5-kw pack, measuring 30x15x12 inches, comprises 40 individual series cells, each 10 in. in diameter. Control gear for the cell is housed in a 4x2x2-ft panel.

One remarkable feature of Bacon's equipment is that while voltage across a single cell is only about one volt maximum, current on overload from this 10-in. cell can be as high as 300 amp.

The idea for the cell was conceived by F. T. Bacon in 1932. The present model is the result of ten years work by Bacon and his associates, Marshall of Cambridge Electronics, Ltd, and an investment of $224,000. In recent years, the work has been financed by the National Research Development Corp, a non-profit, government-sponsored group. Although progress on the Bacon cell had been reported in 1955 (EW, June 6, 1955) and at the 1956 World Power Conference, the August demonstration was the first evidence that it had reached a practical stage.

### Cell Suitable for Traction Use

In its present form, the Bacon cell is considered to be suitable for traction purposes. It can take large overloads without damage. It has no moving parts except control valves and is thus silent and vibration-free. The only exhaust from the unit is water. A traction vehicle could be refuelled by merely replacing the oxygen and hydrogen tanks.

For the power industry, the cell may ultimately provide an economic method of utilizing off-peak power. During the night, excess energy could be rectified and used to electrolyze water into hydrogen and oxygen gas. The gases would then be stored until peak hours, when they would be fed into batteries of Bacon cells, producing d-c power. After conversion to ac, this power could be used for peaking.

Engineers pointed out that much further development is needed, both to reduce the size and weight of the control unit and to investigate more fully the effects of impurities in the gases. Because of the high costs of automating the cell, it appeared that units smaller than 100 w would be uneconomic.

In its present state, the power per unit volume, excluding control equipment, is 10.7 kw per cu ft. Power per unit weight is 9.2 watts per lb. To produce a kwhr, about 0.112 lb of hydrogen and 0.893 lb of oxygen or 20 cu ft of hydrogen and 10 cu ft of oxygen at standard temperature and pressure are required. Approximately 0.9 qt of water is produced as a byproduct of each kwhr.

To speed up refinement of the cell, the National Research Development Corp has sold manufacturing rights in the U. S. to the Universal Winding Co, of Cranston, R. I. Universal is reported to have since spent more than 20 times the British outlay for the cell. Its Patterson Moos Division has already delivered some small power units to the U. S. Air Force. To date there has been little evidence of any industrial or military backing for further development of the Bacon cell in Britain.

What kind of performance could a utility expect in using a Bacon cell to store off-peak power? Elec-

trolytic production of hydrogen and oxygen is not common in the U. S. today, but modern plants currently being built overseas are expected to have efficiencies of about 75%. Assuming a 65% efficiency for the Bacon cell and relatively small losses in the rectifier and inverter equipment, the overall efficiency might be around 45%, for a system such as that shown at the top of page 76. Of course, the economic feasibility of such a system would depend on the still undetermined cost of the ultimate system.

## Bacon Cell Operation Is Based on Simple Chemistry

Each cell of the 5-kw pack consists of two circular electrode plates, made of porous sintered nickel, which form the hydrogen and oxygen electrodes. Between the electrodes is a 2-mm layer of 40% potassium hydroxide electrolyte, heated to 200 C and under a pressure of 400 psi.

Development of the metal plates —primarily a metallurgical problem— was one of the more difficult aspects of the cell development.

The internal surfaces of the electrodes, facing the electrolyte, have a very thin layer of 16-micron pores. On the remainder of the electrode surface, the pores are 30 micron. To help prevent corrosion, the oxygen electrode is treated with lithium and then preoxidized.

The outside face of the positive electrode is surrounded by oxygen under pressure; the negative electrode, by hydrogen. Both the electrolyte and the gases tend to infiltrate the porous electrodes. However, the pressure of the gases keeps the electrolyte from seeping right through the electrodes, while the surface tension of the electrolyte prevents the gases from passing through the small pores on the inner faces of the electrodes. Thus the gas pressure and the pore gradient keep both gases and electrolyte in balance. At the same time, the design provides a very large surface area—about 40 sq meters—where the metal is in contact with the electrolyte.

### Pressure Differential Critical

Since the pressure differential between the two gases must be controlled within a few inches of water, the control system was also a major development problem. The oxygen pressure is kept constant. The hydrogen pressure is then balanced against it by an accurate differential pressure meter, which is coupled to the servomechanism operating the gas inlet valves.

The chemistry of the cell is simple. Oxygen in the positive electrode combines with the water in the electrolyte to form negatively charged hydroxyl ions. Each ion removes one electron from the positive electrode.

$$O_2 + 2H_2O + 4e \rightarrow 4OH^-$$

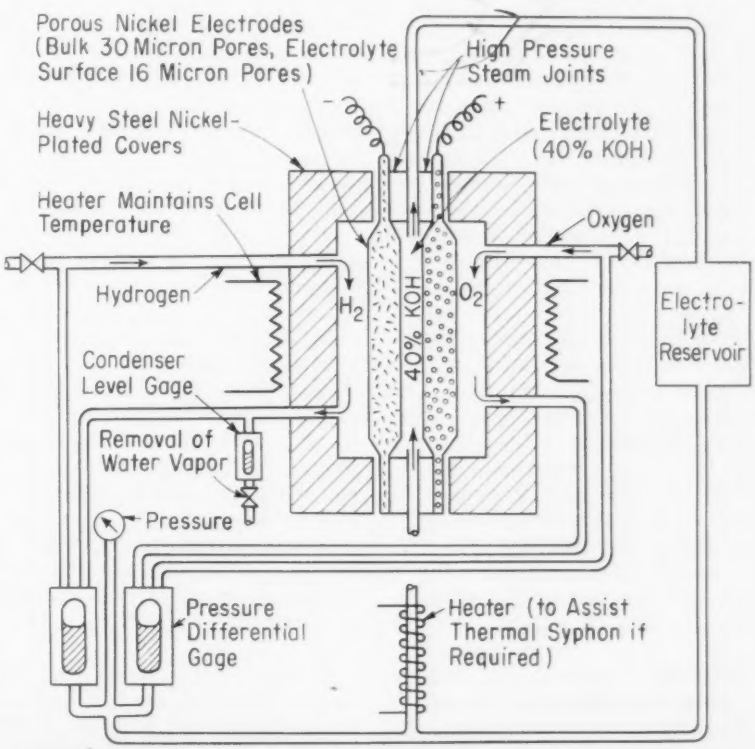
The hydroxyl ions migrate through the electrolyte to the negative electrode, where they combine with the hydrogen to form water. At the same time, they deposit an electron in the hydrogen electrode, making it negative with respect to the oxygen electrode and causing a current to flow through the external circuit.

$$4OH^- + 2H_2 \rightarrow 4H_2O + 4e$$

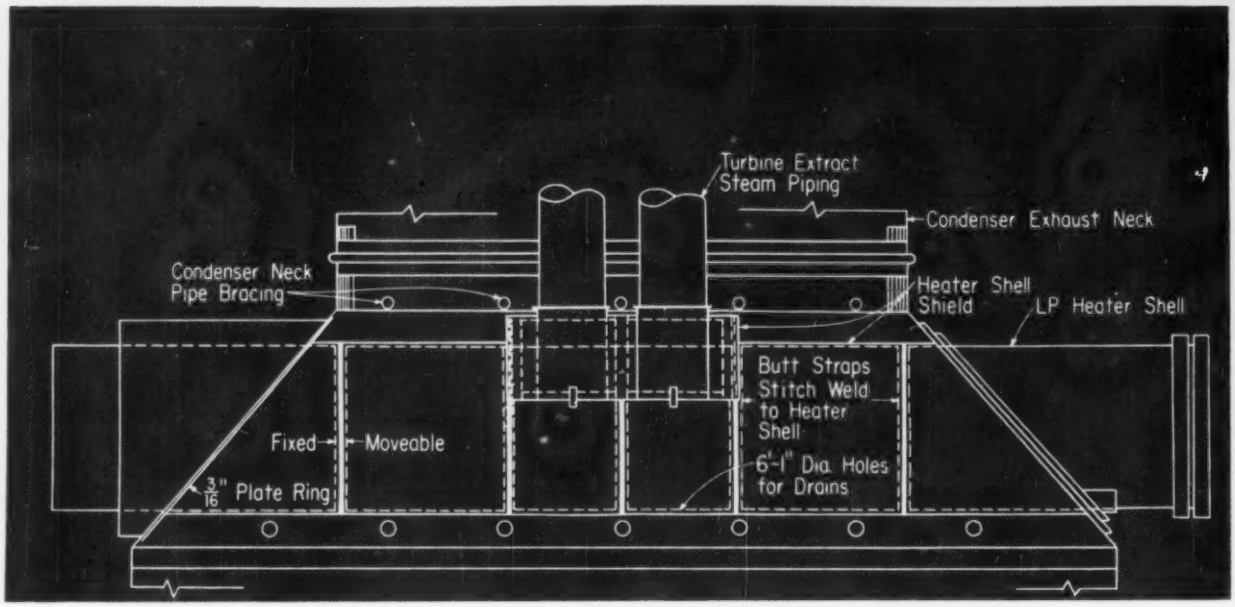
The byproduct water formed by the reaction is removed by circulating the hydrogen in the area behind the electrode, and then passing the resulting mixture of hydrogen and steam through an external circuit where the steam is condensed and removed as water.

The theoretical voltage obtainable can be increased by raising the gas pressure. But the greater the pressure the more the possibility of damaging the delicate porous surfaces. Bacon's cell can operate between 300 and 600 psi, but at 400 psi the plate life of the electrodes is reported to be unlimited.

The speed of the reaction also depends on temperature. In the model shown, the working temperature is about 200 C. In the initial stages, the system is brought up to temperature by an electric heater.




**FORMATION OF OH IONS** removes electrons from $O_2$ electrode. Ions migrate to $H_2$ electrode, deposit electrons and set up emf across external circuit




**SHIELDS** installed on the condenser-neck heat shell prove effective at reasonable cost in preventing loss of heat from higher-temperature extraction steam to the exhaust steam, resulting in a loss of gross power generation

# Spaced Shields Improve

## Simple, low-cost measure stops heat loss from extraction steam to exhaust steam in operation of central station unit

**GEORGE W. SWITZER,** Mechanical Engineer, Gilbert Associates Inc, New York, N. Y.

Spaced shields on all extraction members in the path of exhaust steam are a simple and inexpensive way to improve the turbine heat rate of many of today's central station steam turbine units. Shields are applicable to units incorporating double and triple-flow exhaust ends.

Most of these units have one or more feed-water-heating extraction pipes taken from nozzles in the low-pressure element of the turbine. This places the extraction steam piping in the condenser neck in the path of the exhaust steam between turbine and condensers. In some units, one or more feed-water heaters are in a shell across the condenser neck.

As extraction steam has a higher pressure and temperature than exhaust steam, extraction pipes or heaters in the path of the exhaust steam lose heat to it. This loss increases the quantity of steam extracted from each extraction stage. It therefore amounts to a steam leakage from the extraction stage to the condenser. Loss of steam from the turbine's blade path means a loss of gross power generation.

The feeling is general that such losses are minute. This is due to the fact that the advent of large-size, double-flow units has latent in it a problem not yet generally recognized. Stopping the loss by the usual insulation brings objectionable bulk, along with the necessity of drop-tight jacketing to prevent the insulation from becoming waterlogged from moisture in the exhaust steam. Such jacketing is expensive.

In justifying any method of preventing this heat loss, two questions should be asked: Is the loss of any appreciable magnitude? Can it be prevented by any cheap and simple means which does not have the objections of bulk, water logging, or deterioration?

Investigation of the magnitude of the loss on a particular machine developed several factors bearing on the transfer of heat to the exhaust steam, such as:

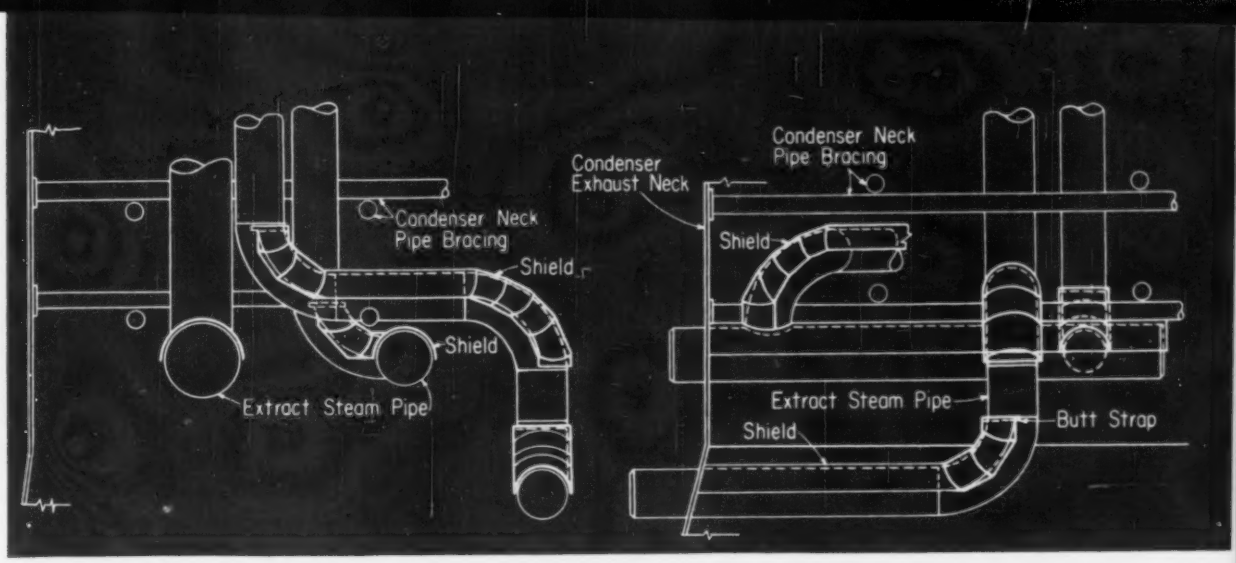
**1.** The average velocity of exhaust steam over the full area of the condenser neck is about 17,000 ft per min at guaranteed capability of the machine.

**2.** Moisture in the exhaust at guaranteed capability is 4.5%. This means that about 68 lb of moisture flow through each square foot of condenser neck each hour.

**3.** As the exhaust steam flows downward across the horizontal pipes, the upper half of each horizontal pipe is hit by the exhaust steam containing moisture. The exposed pipe surface is 1.57 sq ft for each square foot of projected pipe area. Thus moisture impinging or wiping across the pipe surface is 43 lb per hr per sq ft of pipe surface.

If the outside surfaces of the extraction pipes and heaters maintain the wetness with the high-velocity impingement to which they are subjected, the film coefficient is in the order of 1,200 to 1,500 Btu per hr per sq ft per degree F. As it is condensing, the inside film has the same coefficient. Thus it is known that the overall coefficient is 500 to 600 Btu per hr per sq ft per degree F.

If, on the other hand, the outside surfaces were to dry, even with the high velocity of steam flow across the surfaces, the film coefficient drops to about 100 Btu per hr per sq ft per degree F, and the overall coefficient to about 80. Furthermore, if the outside surfaces of the pipes can maintain a dry, superheated, quiescent layer of steam, the




**HALF SHIELDS** applied over extraction steam pipes in the condenser neck also minimize loss of heat from extraction steam to exhaust steam, and consequent loss of steam from blade path of turbine. Shields are plug welded to pipe

# Steam Turbine Heat Rate

film and the overall coefficients drop to 5 to 8 Btu per hr per sq ft per degree F.

Now, when an overall coefficient of 500 is assumed for the bare surfaces in the high-velocity exhaust steam, the evaporation of 43 lb per hr of moisture from a square foot of upper-half pipe surface can only take place if the temperature difference between steam in the pipe and the exhaust steam outside is at least 86F. With exhaust steam at 90F, this gives a temperature of 176F for the steam temperature inside the pipe.

Thus one of two situations obtains. Either the extraction steam temperature is below 176F and the outside surfaces remain wet and agitated with a high transfer rate, or the extraction steam temperature is above 176F and the transfer rate diminishes only after the impinging moisture evaporates.

Thus a high rate of heat transfer takes place on the surfaces of the bare pipes, and an insignificant transfer when the impinging moisture can be diverted, allowing the pipe surfaces to become dry, superheated, and quiescent.

These findings suggest that a spaced shield can divert the stream of wet exhaust steam from the pipe and heater surfaces.

The first investigation, in 1952, was on a 100-Mw, double-flow exhaust unit with one heater shell and two sets of extraction piping in the condenser neck. Calculations of power generation loss, based on the 500-Btu transfer rate, indicated a loss of 140 kw. Assuming station cost is $150 per kw and energy cost 5 mills per kwhr for a seven-year period, the capitalized value of the loss is about $65,000. Shields over only the upper half of horizontal runs of extraction piping and feed water heater cost $4,000.

The net loss is calculated as the difference between gross loss and the change in exhaust steam losses due to keeping the steam in the blade path. Because the savings per square foot of pipe are different for each extraction stage, each stage should be investigated to see if installations of shields over the extraction piping or heater is justified.

### NYSE&G Uses Shields

This machine, the No. 4 Unit at the Greenidge Station of New York State Electric & Gas Corp, went into service in 1953. Shields were also used over the extraction piping on the No. 1 Unit of the same company's Milliken Station. A third application was that over the heaters and extraction piping of the No. 4 Unit at Russell Station of Rochester Gas & Electric Corp.

Later inspections at Milliken disclosed some distortion of the pipe hangers, due apparently to the difference in cooling between the bottom and top sides of the pipes. Accordingly, on that station's No. 2 Unit, as well as on No. 12 Unit at RG&E's Beebee Station, the shields were designed to surround the extraction steam lines and heaters.

Application for patent on the spaced shields for retarding heat transfer was submitted in 1953 and a patent was issued in 1958.

In applying the shields, girth bands about ¾-in. thick are laid as spacers around the pipes or heater shells. The shields' formed sections are then laid over the bands to which they are plug welded. In later designs, one end of each shield section is plug welded to the girth bands, the other being held down by bolts through slotted holes loosely enough to permit free expansion relative to the extraction steam member.

In applying shields to surround heater shells or extraction steam line completely, each section between girth bands has a drain hole, no effort being made to tighten the shields against steam and water drippage. A shield is thick enough to support to person walking on it without suffering permanent deformation.

# Twelve Key Trends in Today's T

**Changing patterns of high voltage transmission are setting the stage for a new round of standardization that will affect future system costs, operating convenience and reliability**

S. B. **CRARY**, Electric Utility Engineering Section, Apparatus Sales Department, General Electric Co, Schenectady, N. Y.

Today it is particularly important to recognize and weigh the principal trends in high voltage power transmission, at a time when future power systems are being planned and alternative system designs are being considered. Present transmission trends are for the most part being very consistently followed, and they will have an important bearing on the contributions that standardization can make to cost, operating convenience and reliability of future power systems.

Long-range system studies of voltages higher than those in general use are continually being made by the electric power industry. Today they are vitally necessary in order to decide as soon as possible on standard voltages, such as 345 kv and 460 kv.

The major trends in transmission system and equipment design which have occurred, and which are expected to continue are these:

**1.** Growing acceptance of extra-high voltages of 345 kv, 460 kv, and higher.

**2.** Increased circuit loadings. This is one of the most effective means of reducing the cost of energy transmission.

**3.** Reduced line insulation. Continuing studies may lead to further reductions in possible interruptions of service caused by lightning and switching surges, and thus allow further reductions in line insulation.

**4.** New high-voltage tower designs, both single-and double-circuit.

**5.** Faster, more intelligent, and more reliable relaying.

**6.** Reduced losses through larger (bundled), conductors, more efficient transformers, and kilovar control.

In addition to these trends in electric power transmission it is possible to recognize certain definite trends in other aspects of system design and operation. All of these have resulted in reduced transmission and generation costs. The trends are these:

**7.** Solid grounding and increased the use of interconnections. Solid grounding has resulted in large savings in transformer and line insulation. The ground-fault neutralizer is no longer being used for systems of 115 kv and above.

**8.** Larger transformers and generating units, lower-than-normal reactances for both transformer and generator, and reduction in transformer insulation (BIL) for the same operating voltage levels.

**9.** Higher interrupting capacity circuit breakers of 25,000 Mva and higher, and with higher continuous-current ratings. The availability of high-capacity circuit breakers has been one of the most important factors permitting the development of solidly interconnected high-voltage systems. This has resulted in systems which are reliable in operation as well as simple in design.

**10.** Development of operating procedures to reduce the severity of disturbances resulting from transmission and generator outages. In order to regulate system voltages it has become necessary to control very large blocks of kvar by using either switched capacitors or synchronous condensers and available generation, or both.

**11.** Reduced line voltage regulation. Very low or even zero line voltage gradient can result in maximum circuit capability, reduced losses, and increased stability. Another aspect of good line voltage regulation is the maintaining of all

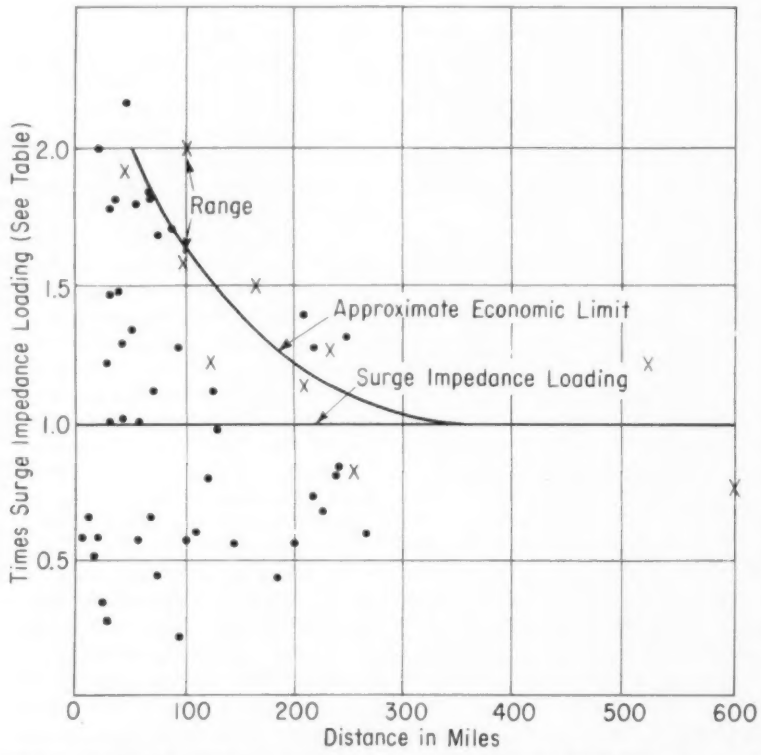



**FIG 2—APPROXIMATE TRANSMISSION ECONOMIC CAPABILITY** and actual loadings in terms of surge impedance loading. X marks EHV system loadings

voltages within the 5% band between nominal and maximum voltage.

**12.** The use of conductors that are sufficiently large to carry high loadings economically tends to remove television and radio interference as a primary transmission line design consideration for many systems. However, it may be reintroduced when voltages of 460 kv and higher are used.

Figure 1 illustrates the low cost of electric power transmission, in mills per kilowatt-hour, for circuit loadings of the order of 200,000 to 500,000 kw, that are obtainable by the modern system design and operating practices that have been listed above. Electric power transmission now appears to be competitive with railroad transportation of coal at equal distances, so that mouth-of-mine generating plants must be seriously considered. The differences in transmission energy cost for any two adjacent voltage levels near the optimum is relatively small for the same power transfer.

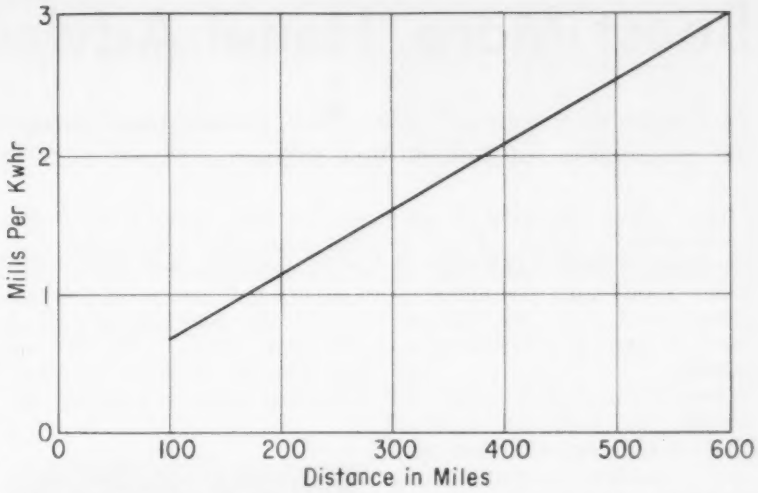



**FIG 1—COST OF ELECTRIC ENERGY TRANSMISSION** at 50% load factor based on 11.5% annual charge on investment.

### Quick Reclosure Brings Benefits

System stability criteria are normally determined on the basis of three-phase faults close to step-up transformer banks. Short circuits near a high-voltage sending-end bus are more severe, in general, than those located at the receiving end. Therefore, a three-phase fault near the bus requires rapid tripping and quick reclosure. Such quick reclosure can be used to increase the stable operating loads considerably and to make possible further reductions in line insulation. However, even in those cases where reclosing is not necessary to carry the required loading stably, it still may be desirable as a means of avoiding the possibility of a second fault causing an interruption. In this case delayed reclosure may be desirable so that there is no chance of actually making the situation worse by reclosing with a fault. In any case, in the United States the practice is to continue to use a three-phase fault, or at least a double-line-to-ground fault, as the stability criterion.

Reduction and refinement of margins in line and equipment insulation depend also on switching surge arrester performance and location of arresters.

Line compensation by series capacitors, particularly for distances which exceed 200 miles, can be expected to find greatly increased application within the next 10 years. Quick reinsertion means are desirable for the most economical system design, otherwise the maximum improvement in capability cannot be effectively realized.

Economic line loading requires large power transfers as well as modern system design. Loadings equal to the surge impedance loading are economic for distances of from 300 to 600 miles whereas loads higher than the surge impedance are economic for distances of less than 300 miles. See Fig 2.

The terminal equipment cost, particularly the transformer, for distance of 100 miles may be equal to the cost of the transmission line. At 345-kv, transformer costs are the primary economic limitation for the transfer of power, although switchgear costs are also significant.

The table shows the magnitude of most economic loads for typical long transmission distances. With these loads, hydro-electric generators and their step-up transformers delivering power through long-distance transmission can justifiably use lower-than-normal reactance, and this now applies to thermal units as well. Multiple transmission lines are advisable, with intermediate switching stations about every 100 miles.

(*Continued on page* 118)

**Surge Impedance Loadings (SIL) Per Circuit**
(For Representative Voltage Levels)

| Kv | Single Conductor SIL, Mw | Dual Conductor SIL, Mw | Triple Conductor SIL, Mw | Quadruple Conductor SIL, Mw |
|---|---|---|---|---|
| 115 | 33 | ... | ... | ... |
| 138 | 48 | ... | ... | ... |
| 161 | 65 | ... | ... | ... |
| 230 | 132 | 165 | ... | ... |
| 287 | 206 | 258 | ... | ... |
| 345 | 297 | 372 | ... | ... |
| 400 | 400 | 500 | 570 | 615 |
| 460 | 530 | 662 | 756 | 815 |
| 650 | ... | 1320 | 1510 | 1620 |

Note: Surge impedance values assumed are 400, 320, 280, and 260Ω for single, dual, triple, and quadruple conductors, respectively.

# Boast More, Hamil Advises Co-ops

## As 'successful, permanent enterprises', co-ops should forego the 'psychology of failure' that follows criticism

Start talking and acting like successes instead of failures, REA Administrator David Hamil will be telling co-op leaders this fall at regional meetings of the National Rural Electric Cooperative Association.

Hamil—whose talks will be roughly the same for each of NRECA's 10 regional meetings—said he decided to depart from "a banker's recitation of statistics." Instead, he'll emphasize that if co-ops did more boasting, and less complaining, they would win more friends, and build up their own confidence and chance for success.

The meetings began Sept. 10 in Grand Rapids, Mich.; they will close Nov. 6 in Lewiston, Idaho.

"Every man is his own best reference," says Hamil, and "Americans love a success story, and we are particularly proud of a hometown success . . . Rural electrification (is) . . . one of the biggest local success stories in the history of this country.

"I have noticed, however, that some of you howl as though you are stranded on an alkali flat when, in fact, you are sitting on a gold mine. Frankly, this crying doesn't do you or your cooperatives or the program credit. I suggest it is time to behave in keeping with the success story you have written."

### Co-op Service 'Indispensable'

He is telling the co-ops that they are a success because they supply an indispensable service. The market for electricity "is as sure as any market in the world . . . You see a steadily rising demand. You see a good repayment record and an increasing net worth. And you see that you are the owners of these ever-expanding businesses.

"A successful, permanent enterprise also is anxious to assume more and more responsibility for running its own affairs (and) . . . behaving like a success also means evaluating yourselves honestly," points out Hamil. "It means meeting criticism in a reasonable manner. Some of you reply to any criticism by stating that you are practically broke, that Washington is out to ruin you, that somebody has stacked the deck against you. I have listened to that sort of talk ever since I became Administrator, and I still am not sure what all the shouting is about. Every loan application that has met

HAMIL: 'You're sitting on a gold mine'

REA's standards has been approved without exception."

On particular issues, Hamil has a few words: "Recently, REA issued a revised bulletin on patronage capital and margins, with the suggestion that you work out some sort of plan for allocating margins on a patronage basis. This is part of the task of identifying ourselves as co-ops, but it doesn't stop there. We have got to sell ourselves in every way possible . . .

"A number of you take issue with every proposal which has been made by this Administration concerning REA's future. That is your privilege of course. But when you claim that you are barely getting by on a 2% interest rate, when you protest that you couldn't possibly help operate a bank of your own because you are too poor, I don't think you are giving your future much serious thought. I think you are falling back on that psychology of failure . . .

"There is no long-term financing program in the government today which offers borrowers such a low interest rate as does the REA . . . The Administration has suggested only that REA borrowers pay a rate which more closely reflects the cost of money to the Treasury, and that they pay this rate only on new loans. As long as you continue to insist that a more reasonable interest rate would ruin you, it will be difficult to convince the American people that rural electrification warrants their continued support. . . . We will eventually lose this support if we continue to insist stubbornly on a rate of interest which is below the going rate for money.

### Pitfalls of Politics

"Many of you have been concerned about a proposal for a bank for REA borrowers which you might some day own and manage yourselves . . . You know that it will require large amounts of capital in future years to meet rising demands, and the important thing is that you have some place to get it—a place that is not subject to the inevitable ups and downs of politics."

Hamil closes by referring to the unsuccessful push for the Price-Humphrey bill earlier this year (to "free" REA from any control over loans by the Agriculture Secretary): "During the past year, you have had some experience with the injection of politics into rural electrification, and you may have observed that politics is an uncertain business, at best . . . I am sure that politics has no place in such vital programs as those of rural electrification . . . We are in the utility business, not in politics."

## Buckeye Power Formed

Co-op Power, Inc, which served a group of western Ohio cooperatives for ten years, has been replaced by a new state-wide cooperative called Ohio Buckeye Power, Inc. The new group, headed by W. R. Joslin of Sidney, will purchase generating and transmission equipment for member co-ops.

# GO MODERN

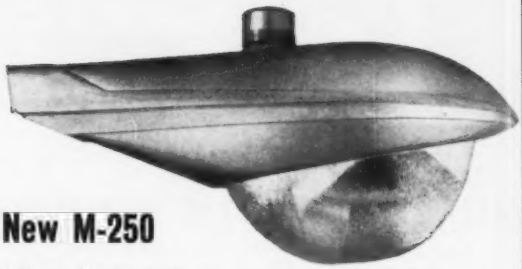
**with the world's newest mercury luminaires from General Electric**

**New beauty, efficiency, safety for every street and highway**

GENERAL ELECTRIC

# GO MODERN

## with General Electric's new mercury luminaires

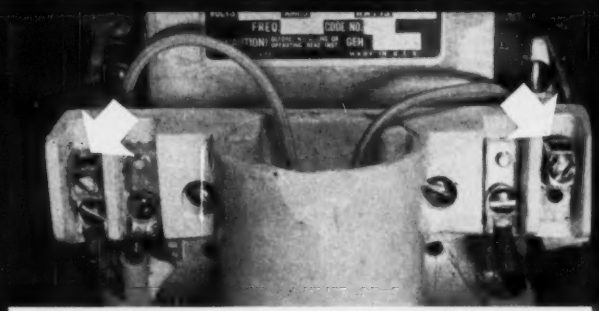


**New M-250**

175 and 250 watt
residential and light-traffic streets

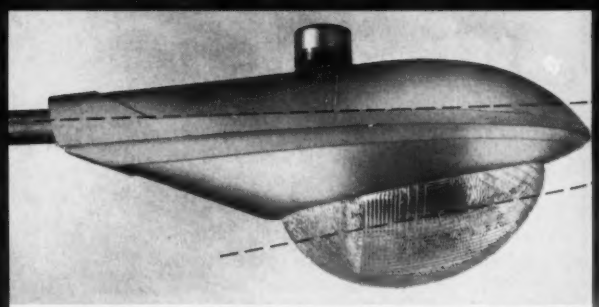
# Get top efficiency, new modern s

**POWER PACK** built-in ballast saves $50-75 per unit during installation—175- to 1000-watt sizes.

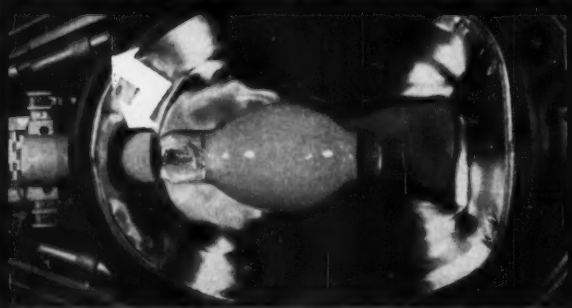


**TERMINAL BOARD** allows quick hook-up with two clamp-type screws; eliminates splicing, other interconnections.

**UNIVERSAL SLIPFITTER** easily adjusts for 1¼- or 2-inch brackets. Requires no additional parts.

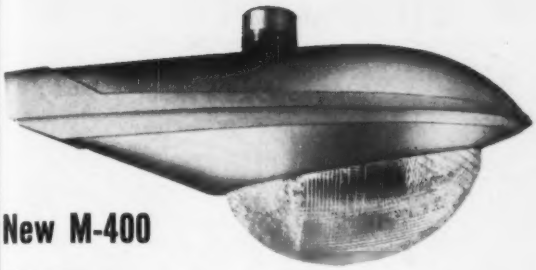


**TILTED OPTICAL ASSEMBLY** directs light where it is needed, contributes to graceful styling.



**SEALED OPTICAL ASSEMBLY**—silicone rubber gaskets block entry of bugs and dust, reduce cleaning.

**UNIT PHOTOELECTRIC CONTROL** with dependable new G-E cadmium sulphide cell locks on top of unit.



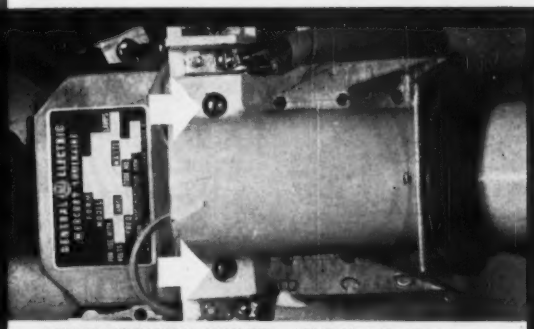
**New M-400**

400 watt
business and traffic streets, highways

**New M-1000**

700 and 1000 watt
whiteways and shopping centers

# styling, plus these extra values



**MULTI-POSITION SOCKET**—IES distribution types are easily selected by simple screw adjustment.

**LAMP FLEXIBILITY**—complete lamp selection—clear, white, color improved, 175 to 1000 watts.

**ACRYLIC REFRACTOR** on M-250 unit, heat-resistant glass refractors on other units, cut breakage.

Smart styling . . . unequalled efficiency . . . economical operation . . . all are yours with new General Electric mercury luminaires. And, for the first time you'll find ratings for every street and highway *in a single design family*. 100% designed by General Electric — with components engineered to work together—this new mercury line delivers these major user benefits:

**Unparalleled photometric performance** — Precisely contoured reflector and proven prism design give optimum light output and control.

**Unequalled electrical efficiency** — Built-in "Power Pack" ballast, first introduced by G.E., provides lowest "watts loss" in the industry; available in all ratings.

**Wide flexibility**—IES distribution types may be selected by simple movement of adjustable socket. Mount on either 1¼- or 2-inch bracket with universal slipfitter.

**Low installation and maintenance costs**—Easy access to all components, convenient two-connection pre-wired terminal board for wiring, unitized construction make installation simple. Long-life ballast, positive gasketing, heat-resistant glassware minimize maintenance.

Get full information from your General Electric Apparatus Sales Engineer or Agent today or use the coupon below.

*Progress Is Our Most Important Product*

**GENERAL ELECTRIC**

Section F450-5, General Electric Co., Schenectady 5, N. Y.

Please send me free bulletins on the subjects checked below:

☐ New Mercury Luminaires, GEA-6943

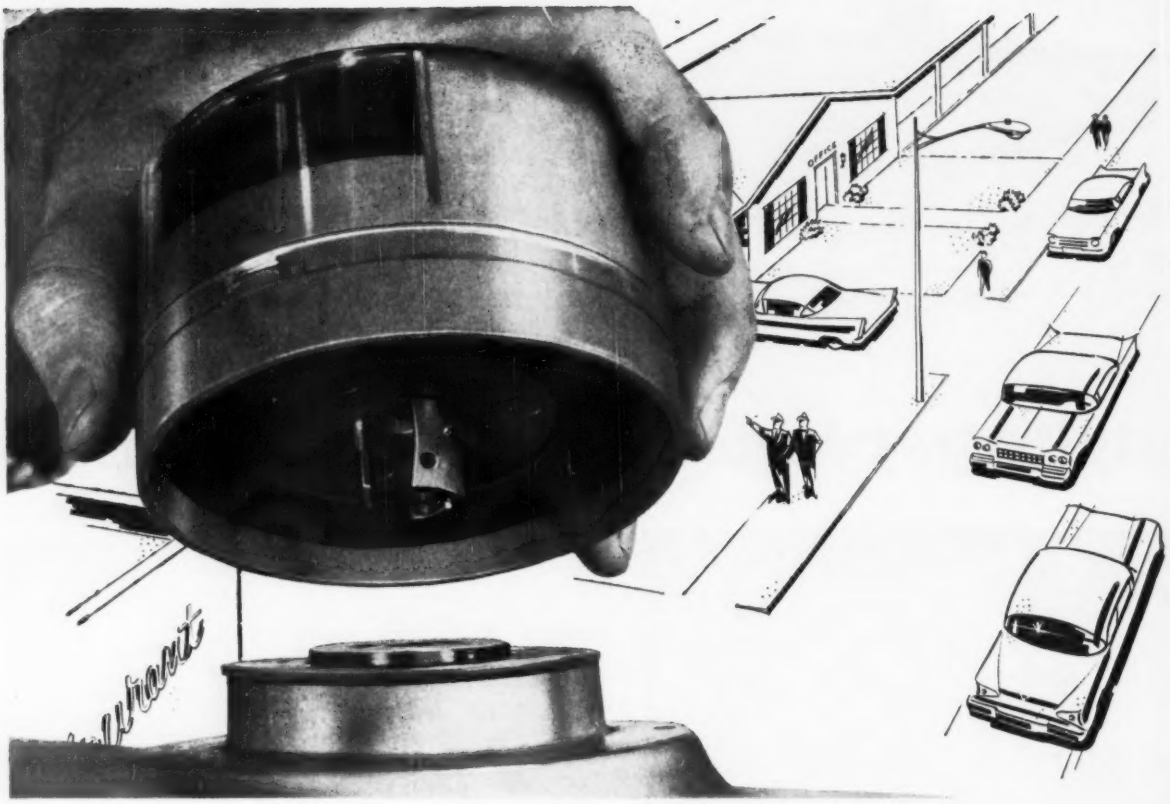
☐ Cadmium Sulphide Photoelectric Control, GEA-6987

Name_____

Company _____

Street_____

City _____ State_____



# Reliable—after years of tests

## New G-E cadmium-sulphide control installs in seconds . . . lasts for years

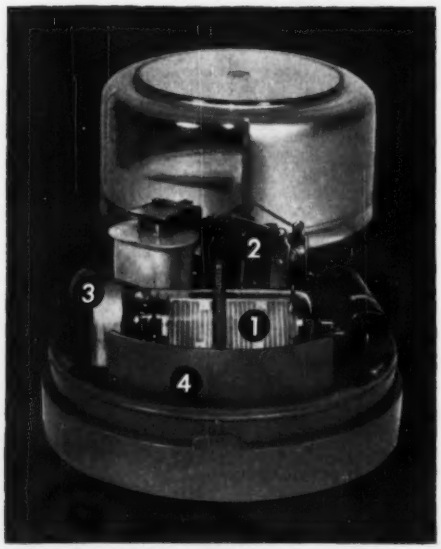
Now, from General Electric comes the industry's newest, most dependable cadmium-sulphide photoelectric control. Years have been spent in the research, design, and testing of this new street lighting control to produce the most efficient, most reliable cadmium-sulphide control available. Now, after exhaustive testing, the reliability problem has been solved with a custom-built General Electric cadmium-sulphide cell. Shock, surge, humidity, vibration, load, temperature—these were among the tests conducted —but none was found to alter the dependable performance of the new G-E control.

Addition of the new cadmium-sulphide cell is but part of the story. General Electric has developed a new, simplified circuit with specially-engineered long-life components . . . designed and built to work together and to reduce your control costs.

Get the full details from your General Electric Apparatus Sales Engineer or Agent, or write Section 450-25, General Electric Company, Schenectady, New York.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC




**ADVANCED DESIGN FEATURES** give: (1) dependability from new G-E hermetically sealed cadmium-sulphide cell; (2) long life from specially-engineered components; (3) built-in protection from voltage surges; (4) power savings through accurate external adjustment. NO VACUUM TUBES OR RECTIFIERS.

# Permanent Test Set Measures Steam Leak-Off

**VIRGIL ADAMS, JR,** Results Engineer, Clinch River Plant, Appalachian Power Co, Cleveland, W. Va.

A permanent installation for measuring steam leak-off from high-pressure turbine control valves permits an accurate determination of the need for cleaning turbine valves. If measurement reveals that the flow has dropped below the prescribed rate, clearance in the control valve is less than the critical dimension and valves need to be cleaned.

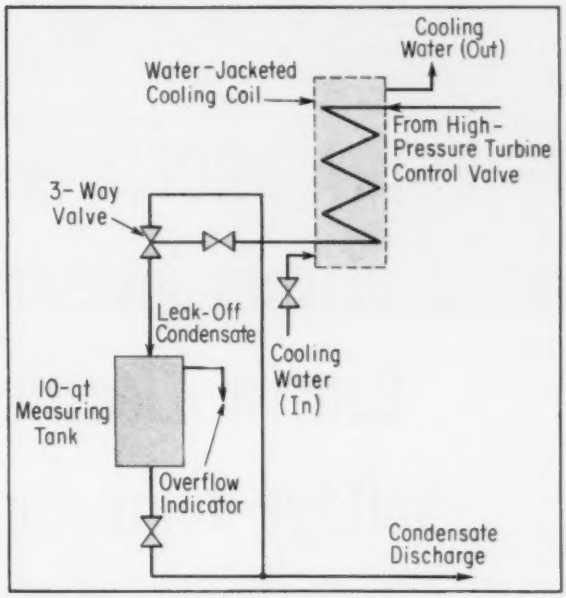
The measuring equipment consists essentially of a permanently mounted 10-qt measuring tank, adjacent to a leak-off cooling coil. The tank is made from a 12-in. section of 8-in. diameter steel pipe, schedule 40, with bottom plate and mounting brackets welded on. A ¼-in. overflow pipe, a ¼-in. 3-way quick-opening bypass valve, and a ¾-in. valve and drain pipe are included. A diagram of the installation is shown.

The tank is set as level as possible, and capacity is accurately measured in advance. In use, the measuring tank is drained and the drain valve closed. The bypass valve is set to establish a flow of condensate around the tank.

The bypass valve is then turned to permit flow into the tank, and a stopwatch is started simultaneously. The stopwatch is stopped as soon as the tank begins to overflow; the valve is turned to bypass.

Flow per hour is calculated as shown in the example. The flow factor used in finding the flow should be placed on a calibration tag on the tank.

Formerly, leak-off condensate was drawn from the cooling coil through a flexible hose and into a 10-qt galvanized bucket. This resulted in inaccurate measurements because of the difficulty of keeping the bucket level and determining the exact moment of spillover. Also, spilled water was messy and hazardous.




**CONDENSATE LEAK-OFF** drains into tank until it overflows. Time to overflow indicates condition of control valves

### How to Calculate Steam Flow Rate

Capacity of 10-qt measuring tank equals 20.8 lb of condensate. Therefore:

$$\text{Flow per hr} = \frac{20.8 \times 3{,}600}{\text{seconds}} = \frac{74{,}880}{\text{seconds}}$$

If it takes exactly 10 min, or 600 sec, to fill the tank, then:

$$\text{Flow per hr} = \frac{74{,}880}{600} = 124.8 \text{ lb per hr}$$

# System Averages Set Branch Inventories

**Balancing of inventory in branch storerooms with system averages permits Duke Power Co to maintain satisfactory stocks. By minimizing the excess, the company cut branch inventories more than $500,000 in one year.**

Every three months the stores supervisors prepare an inventory by classes of all material in each branch storeroom. The list shows dollar value for each class and percent of branch's total inventory per class compared with system averages. When a branch's inventory exceeds the average, the branch manager provides a surplus list. Usually the surplus is ordered back to central stock.

(*More Methods on page* 90)

YOU, TOO, ARE A MAN

WHO HAS TO KNOW . . .

# EXTRA PROFIT is the result of your investment in General Electric voltage regulators

Dividends from General Electric voltage regulators pay off in Extra Profit for you.

In addition to superior product design and workmanship, examine the benefits of Research, Service and Product Dependability that are available with your investment in General Electric regulators. No other manufacturer can match these dividends.

**REGULATOR RESEARCH** from General Electric has provided industry leadership in regulator development, and will continue to provide even more efficient and economical system regulation in the future.

**REGULATOR SERVICE** means experienced G-E application engineers, prompt delivery from local warehouses, expert installation and operation assistance, and an unequalled network of complete maintenance and repair facilities at local Service Shops.

**REGULATOR DEPENDABILITY** gives you absolute minimum maintenance which means less attention during equipment life, and greater operating economy. This is one reason why more General Electric regulators are in use today than any other make.

The effects of a regulator purchasing decision will be felt for many years by operating personnel, responsible for equipment maintenance, and by utility management, responsible for profit. The next time you review your regulator requirements, consider the important dividends which *only* G.E. offers . . . and specify General Electric voltage regulators. General Electric Co., Schenectady 5, New York. 423-38

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***J. Coleman Jones, General Superintendent, tells why . . .***

**DEPENDABILITY** paid a dividend for Pacific Power & Light's investment in General Electric voltage regulators. Dependable performance of G-E MLT-32 three-phase step voltage regulators holds maintenance time and cost down, provides reliable substation regulation.

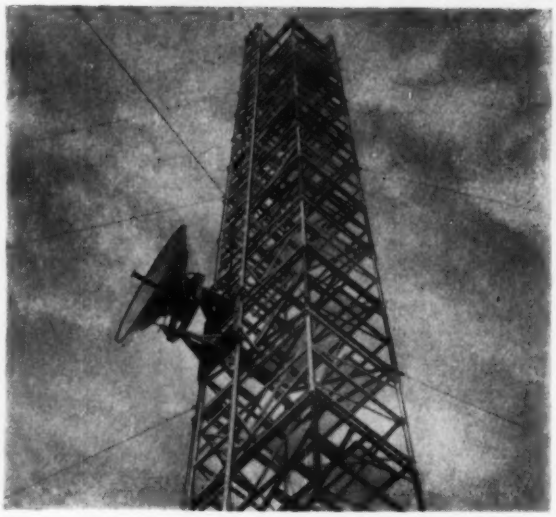
***W. E. Dugdale, Purchasing Agent, tells why . . .***

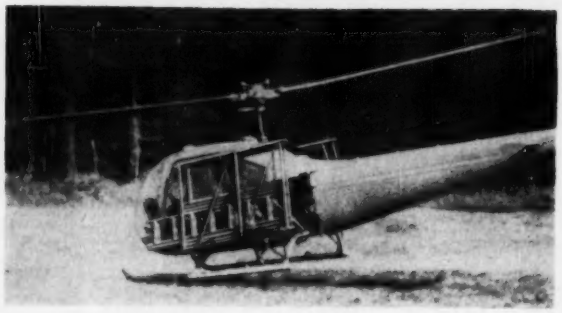
**SERVICE** paid a dividend for Upper Peninsula Power's investment in General Electric voltage regulators. Overnight regulator delivery cut outage time to an absolute minimum.

***George K. Kallenbach, Operating Superintendent, tells why***

**RESEARCH** paid a dividend for Niagara Mohawk's investment in General Electric voltage regulators. G-E system research used network analyzers to determine the optimum regulator arrangement to solve a unique problem.

# Portable Tower Tests Microwave Paths





**TOWER SECTIONS** for 200-ft aluminum tower were carried in single trip from road to inaccessible tower site

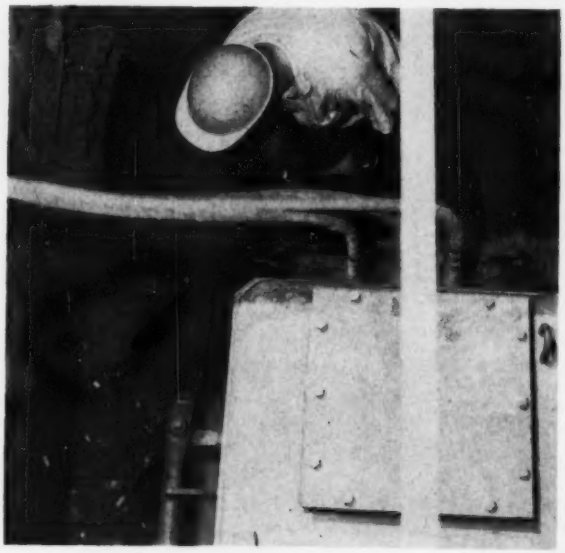
**MICROWAVE PATH** is tested with antenna that moves up and down tower to determine feasibility of using the site

Proposed paths for microwave systems may be tested for their feasibility using portable aluminum towers at possible antenna sites. This method was further refined for Pacific Telephone & Telegraph Co through use of a helicopter to carry the portable towers to and from potential sites.

One proposed site for a microwave tower in mountainous terrain was four miles from the nearest road and equipment had to be flown in. A 200-ft aluminum tower in knock-down sections was carried by helicopter in one trip. After dis-assembly it was flown by helicopter to other path-testing sites.

# Mobile Vacuum Unit Cleans Network Vaults

**W. J. MONTGOMERY,** Asst Division Foreman, Underground Division, Cincinnati Gas & Electric Co, Cincinnati, Ohio



Mobile vacuum cleaning equipment is the factor of success in the cleaning of littered network vaults in the downtown area on a regular program basis. The equipment provides maintenance crews of Cincinnati Gas & Electric Co with these benefits:

**1.** Removal of debris is a much cleaner operation than the former broom and shovel method.

**2.** All portions of the vault, as well as all surfaces of equipment, can be cleaned easily and thoroughly of litter, wet or dry dirt, and small amounts of water.

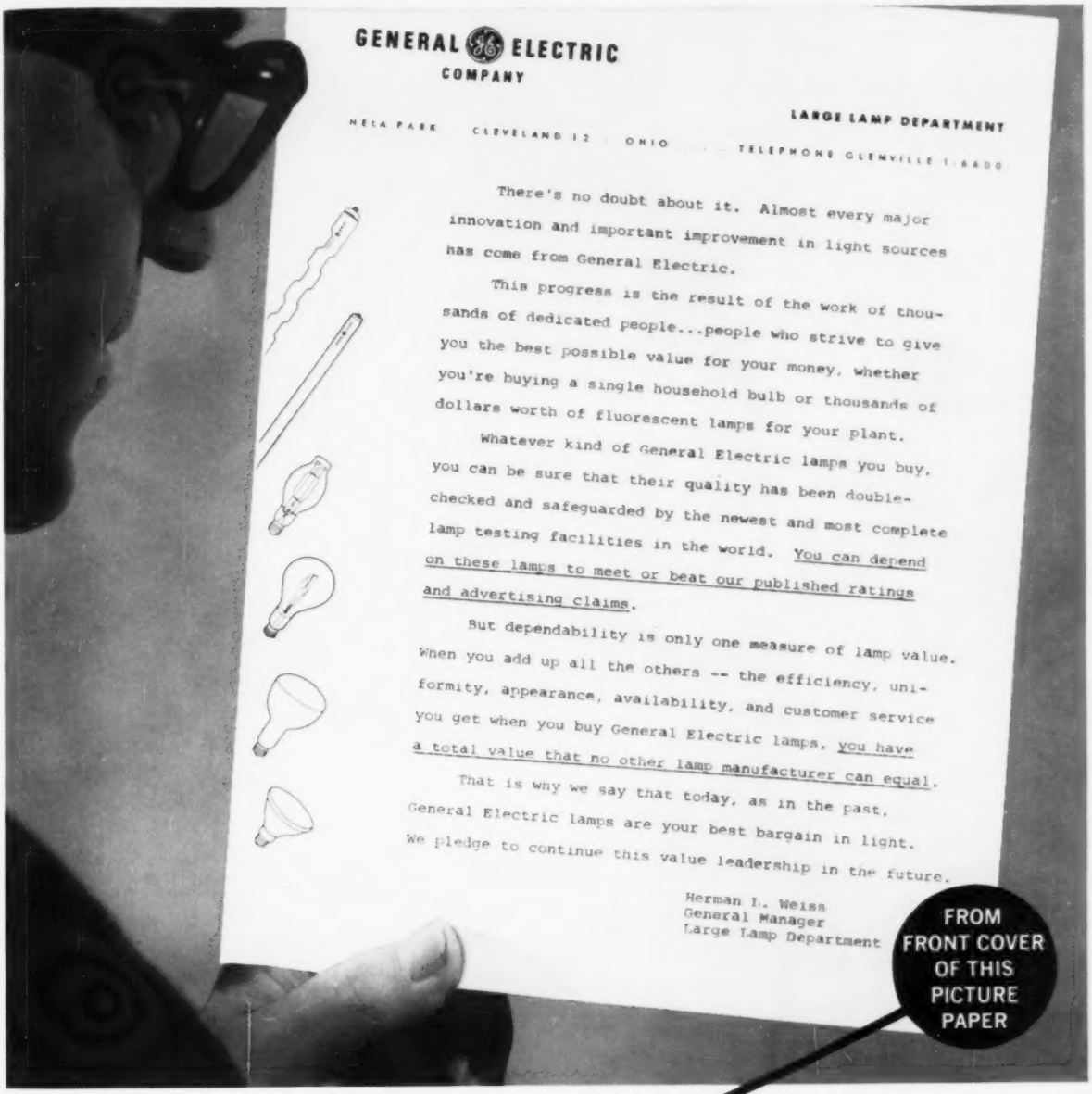
**3.** Debris is collected directly in covered containers that can be hauled to the dump and emptied.

In March, 1958, a program of cleaning network vaults was started using a powerful vacuum cleaner, a twin-vacuum unit powered by two 1⅓-hp motors (Model 500-55 made by American Cleaning Equipment Corp). A 3-in. OD plastic-tip tool speeds the removal of paper, dirt, cigarettes, and small amounts of water from vault floors, and also from underneath, around, and on top of equipment. Included with the cleaner are one 25-ft and two 15-ft lengths of reinforced neoprene 3-in. ID hose. Debris is collected in standard 55-gal steel drums. The equipment is carried in a regular 9-ft bed splicer's van.

During the first seven months of the program, 408 vaults were cleaned thoroughly. Vaults receive additional cleanings as needed following reports from inspectors during each monthly inspection.

# "GENERAL ELECTRIC LAMPS ARE YOUR BEST BARGAIN IN LIGHT"

**A STATEMENT OF IMPORTANCE TO YOU AND ALL YOUR LAMP CUSTOMERS:**


GENERAL ELECTRIC COMPANY
NELA PARK CLEVELAND 12 OHIO
LARGE LAMP DEPARTMENT
TELEPHONE GLENVILLE 1-6600
There's no doubt about it. Almost every major innovation and important improvement in light sources has come from General Electric.
This progress is the result of the work of thousands of dedicated people...people who strive to give you the best possible value for your money, whether you're buying a single household bulb or thousands of dollars worth of fluorescent lamps for your plant.
Whatever kind of General Electric lamps you buy, you can be sure that their quality has been double-checked and safeguarded by the newest and most complete lamp testing facilities in the world. You can depend on these lamps to meet or beat our published ratings and advertising claims.
But dependability is only one measure of lamp value. When you add up all the others -- the efficiency, uniformity, appearance, availability, and customer service you get when you buy General Electric lamps, you have a total value that no other lamp manufacturer can equal.
That is why we say that today, as in the past, General Electric lamps are your best bargain in light. We pledge to continue this value leadership in the future.
Herman L. Weiss
General Manager
Large Lamp Department
FROM FRONT COVER OF THIS PICTURE PAPER

**FREE FROM G.E.** Interesting new data-packed, informative 20-page picture paper, loaded with tips on lowering your customer's cost of light with improved lamps, maintenance, lighting layout. Helps you help him pick the most economical, efficient General Electric Lamps for each specific application. Mail coupon today, or call your G-E Large Lamp Distributor.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

General Electric Co., Large Lamp Dept. C-932
Nela Park, Cleveland 12, Ohio

**PLEASE SEND ME THE "FACTS OF LIGHT"**

*Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

# *Before you buy another tr*

*ertransformer...* **CHECK SERVICE**

## General Electric ships in 24 hours within the U.S.A. ...also rebuilds, repairs, and uprates

**You cut distribution transformer** inventories when you take advantage of G.E.'s fast delivery. No need to keep dollars on your shelves or to spend needlessly on warehouse handling and storage. General Electric has more than one hundred district warehouses, backs them up with extensive factory stocks, and offers you 24-hour shipment when needed.

Overnight shipment is only part of General Electric service. Service Shops—48 of them—put emergency repair service within convenient geographic range; these facilities prove their worth especially in times of flood, fire, and storm. Other service includes repair and uprating of your old transformers as well as technical advice on product or system problems.

**Before you buy another distribution transformer,** check service—give your transformer manufacturer credit for the extra values he gives you. General Electric Company, Schenectady 5, New York.

431-79

*Progress Is Our Most Important Product*

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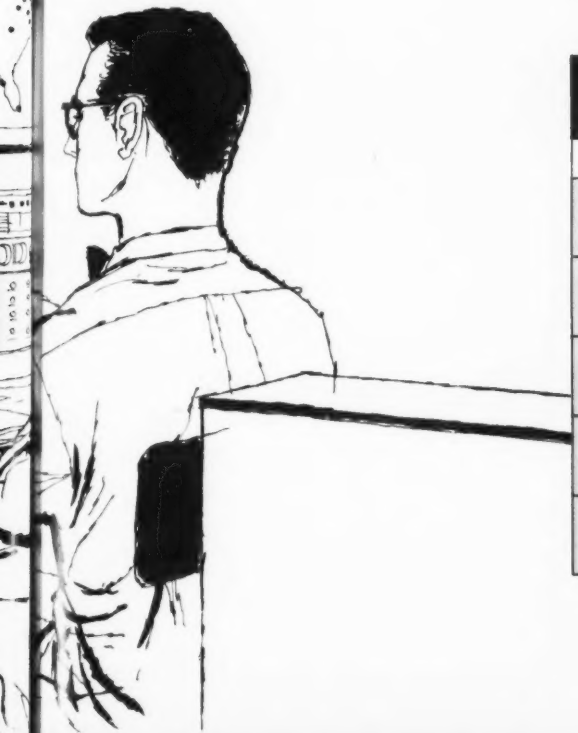


**GIVE YOUR TRANSFORMER MANUFACTURER CREDIT FOR THE EXTRA VALUES HE GIVES YOU**

| | | G.E. | OTHER MFRS. | | | |
|---|---|---|---|---|---|---|
| **MEASURE LOAD BUILDING—do Co.'s other products build load? Does Co. sponsor load-building programs?** | | | | | | |
| **CHECK SERVICE—24-hour shipment? repair and uprating? emergency assistance?** | | | | | | |
| **COMPARE FEATURES—how many exclusive features in terms of longer life; reliability; easy maintenance?** | | | | | | |
| **ANALYZE PRICE—does Co. hold line against inflation with significant product developments?** | | | | | | |
| **EVALUATE INNOVATIONS—has Co.'s research paid off for you? Recent examples?** | | | | | | |

**FILL IN THE BLANKS . . .** See which manufacturer gives you more for your transformer dollar: Mark "X" for a measurable contribution, "O" for insignificant contribution.

# Mount Switches Economically

## An adaptation of distribution standards of Virginia Electric and Power Co

**Notes**

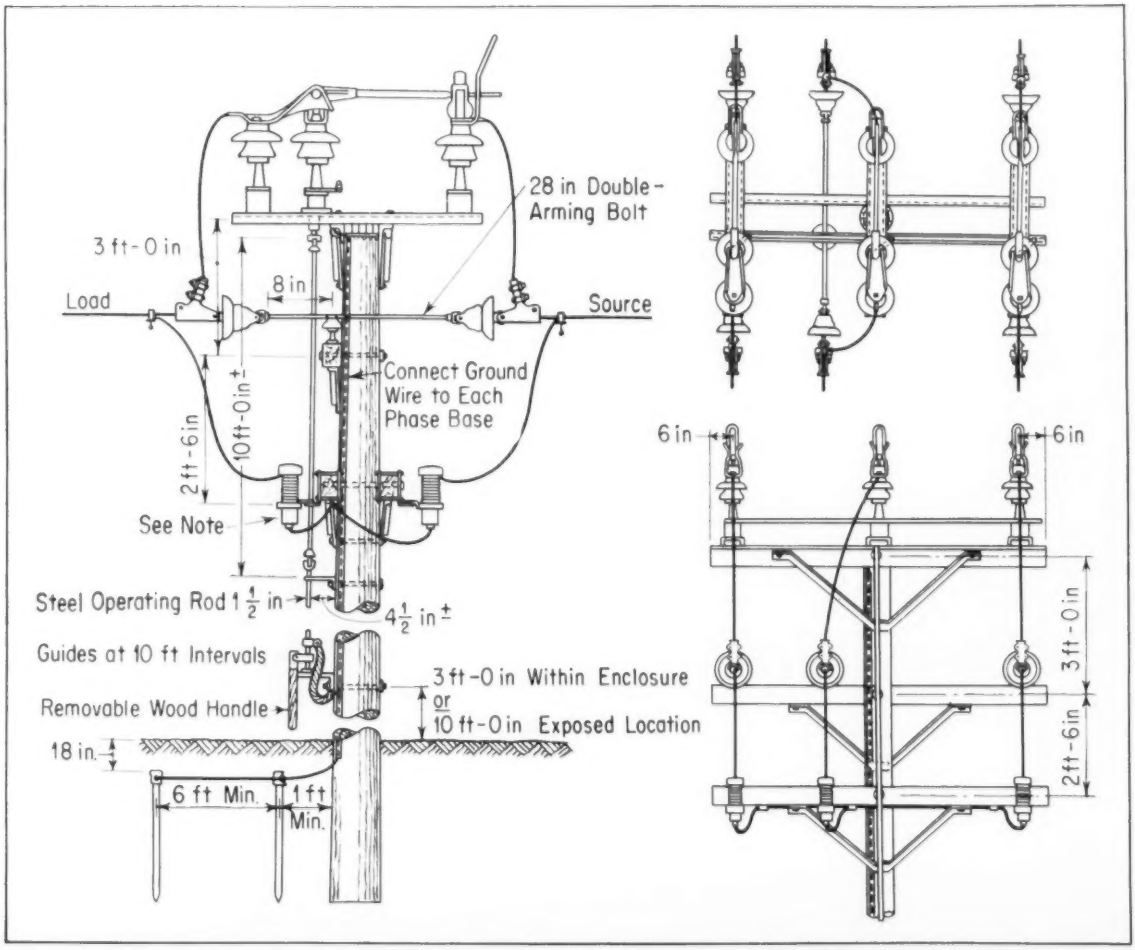
**1.** Conductors can be pushed out from the pole with hot line tools. This permits easier pole replacement, switch replacement, switch insulator replacement, and switch adjustment.

**2.** Arresters on the load side are to be omitted on radial circuits.

**3.** The double-arming bolt between the strain insulators shall be considered at line potential.

**4.** The double-arming bolt is fastened to the pin insulator with a tie wire.

### Airbreak Switch—Rotating Type—2,400-15,000-v Circuits



KEEP PACE WITH COMMUNITY GROWTH!

# Use VICTOR DISTRIBUTION UNITS

VICTOR NO. 5R RADIO-FREED PINTYPE (EEI-NEMA 55-3)

## LOW VOLTAGE PINTYPES

No insulator is made with greater care than a VICTOR Distribution Pintype. They're made with the same Purified Porcelain as those designed to carry 230 KV and more. They're made with the same quality control as every other VICTOR insulator, and they all undergo the same careful routine electrical testing as our high voltage insulators. In other words, VICTOR Distribution Pintypes are premium grade.

## RADIO TREATMENT YOU CAN SEE

The conductive glaze on VICTOR radio-freed pintypes is readily *distinguishable* and *permanent.* It is scientifically compounded for elimination of radio interference. Because VICTOR Pintypes are color coded, you know at a glance whether they are radio-freed. This may not seem like a very important feature. But when you have both in stock, it's mighty convenient for your linemen to pick out radio-treated from non radio-treated insulators easily and quickly. VICTOR radio-treated pintypes are available to you at no extra cost.

## ACCURATE THREADS

Smooth, die-formed porcelain threads assure easy, fast installation. Unitized forming of insulator body and thread assures complete uniformity and accuracy of pin fit. This accuracy is constantly maintained by gauge testing.

## VARIETY OF WIRE GROOVE AVAILABLE

VICTOR Distribution Pintypes may be ordered with top wire grooves to fit the conductor you are using. VICTOR No. 5 or 5R has the standard ⅜" radius top wire groove. VICTOR No. 6 or 6R and No. 9 or 9R are available with either standard ⅜" or 1" radius top wire groove.

## VICTOR DEADEND SUSPENSIONS

VICTOR No. 804, 6" Suspensions and VICTOR No. 801, 7½" Suspensions are made-to-order for deadend work and where a conductor has to turn an angle. The No. 804 has a combined M & E rating of 10,000 lbs. and the No. 801 an M & E rating of 15,000 lbs. Made of Purified Porcelain, with the same above-standard quality control manufacturing methods as all VICTOR Suspensions, they are built to withstand mechanical and electrical stresses far above their EEI-NEMA M & E ratings.

VICTOR NO. 804 6" SUSPENSION (EEI-NEMA 52-1)

## PINTYPES FOR CONTAMINATED AREAS

Several types of specialized pintype insulators are available for areas troubled with fog, smog, salt-laden air, chemical and industrial fumes. We call your attention particularly to our Nos. 33, 34, 134, and 135.

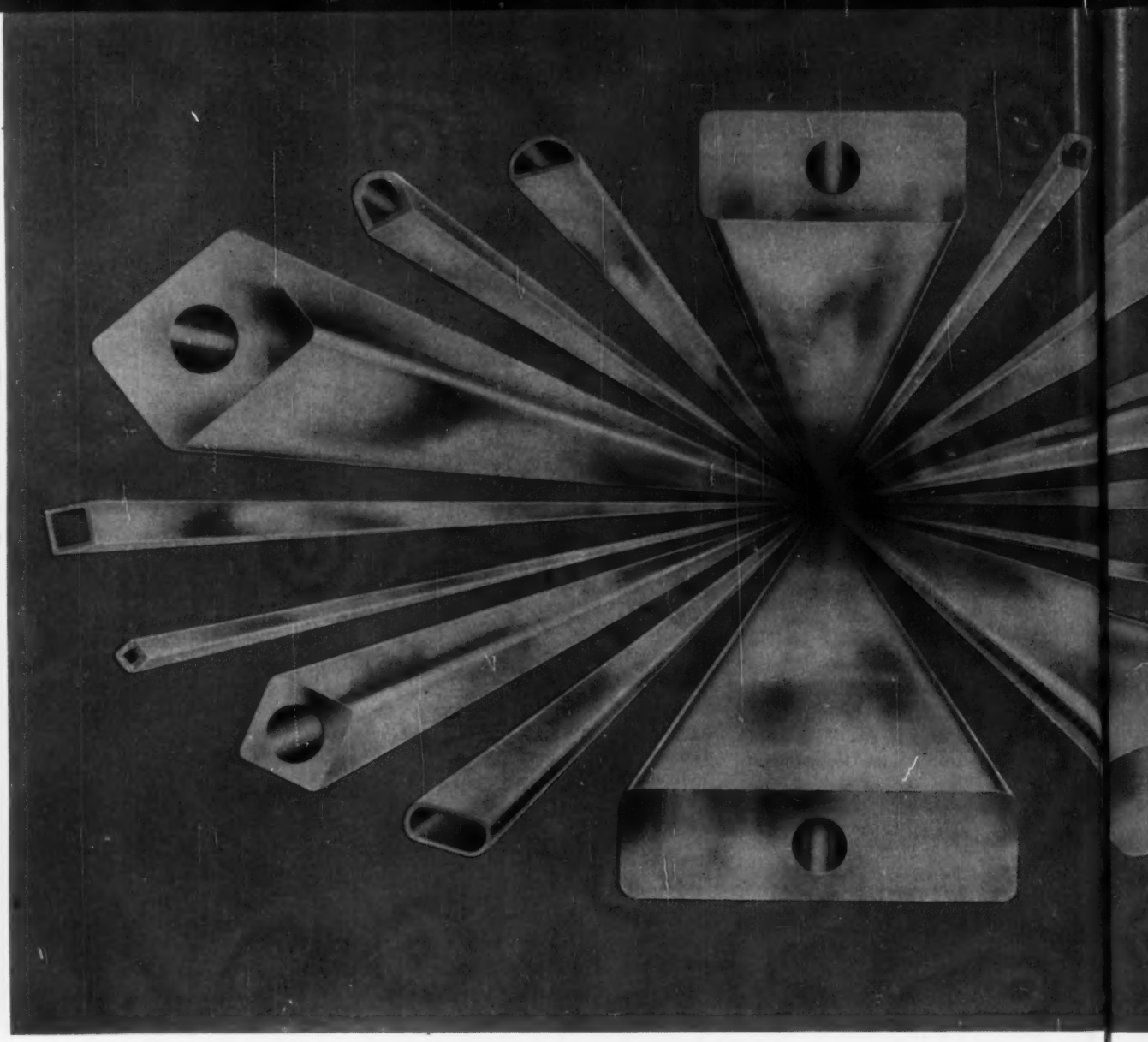
For full information regarding VICTOR Distribution Pintypes and Suspensions, write I-T-E Circuit Breaker Company, Victor Insulators Division, Victor, N.Y.

VICTOR FOGBOWL PINTYPE (NOS. 35, 36, 39 and 40)

VICTOR FOG PINTYPE (NOS. 33, 34, 134, 135)

I-T-E CIRCUIT BREAKER COMPANY

VICTOR INSULATORS DIVISION



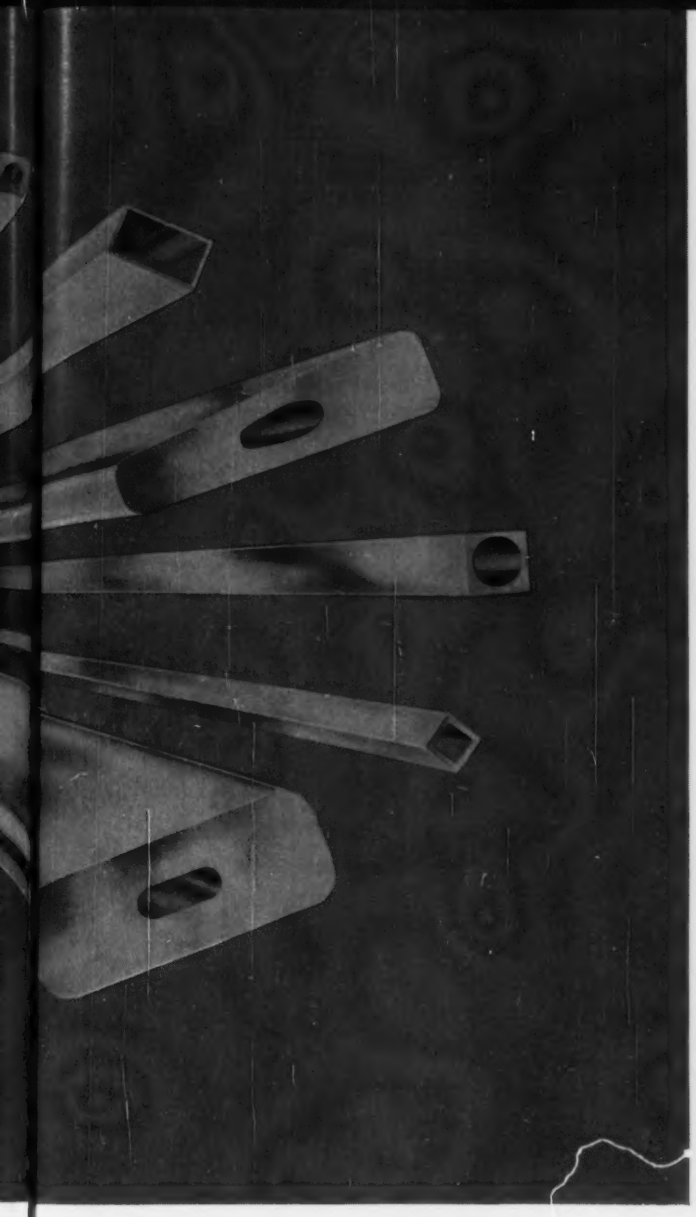
# THE SHAPE OF THINGS TO COME WITH ANACONDA

**Fluid-cooled copper conductors.** The growing need for compact electrical assemblies which can handle high current densities is leading to an ever-increasing variety of hollow, fluid-cooled copper conductors. The samples shown full size above give some idea of the range of sizes and shapes produced by The American Brass Company.

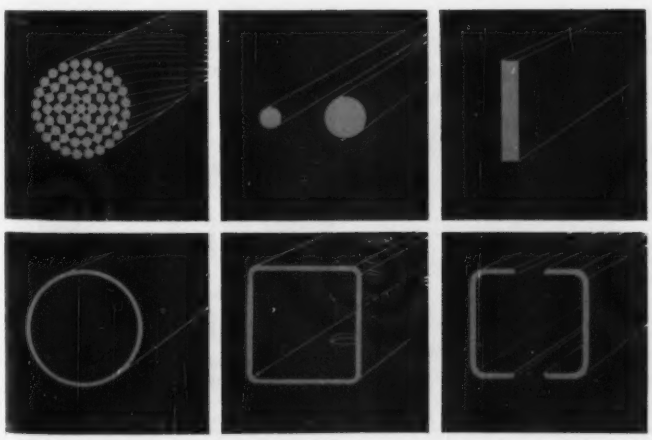
Nuclear physics magnets are, perhaps, the most spectacular applications of fluid-cooled conductors. These hollow conductors range from tube .182" square O.D. x .083" square I.D. to heavy rectangular bars with a round core for water cooling.

**Industrial applications.** The use of fluid-cooled conductors is growing rapidly in large electrical equipment. Generator output can be greatly increased, without increasing frame size, by cooling stator and rotor bars. Fluid-cooled conductors are being used in heat sinks for rectifiers and induction furnace coils. Another interesting use is in compact water-cooled windings needed to provide very high flux densities in, for example, the ceramic magnet manufacturing process. These "solenoids" are being built for applications in which the current range is from a few hundred to about 2000 amperes.

**Technical assistance.** Whatever your problem—liquid-cooled field coils, rotor bars or a special-shape tubular conductor—technical specialists at The American Brass Company can help you work out the size and shape best adapted to your needs. See your American Brass representative or write: The American Brass Company, Waterbury 20, Conn. In Canada write: Anaconda American Brass Ltd., New Toronto, Ont. 5942



# ELECTRICAL COPPER



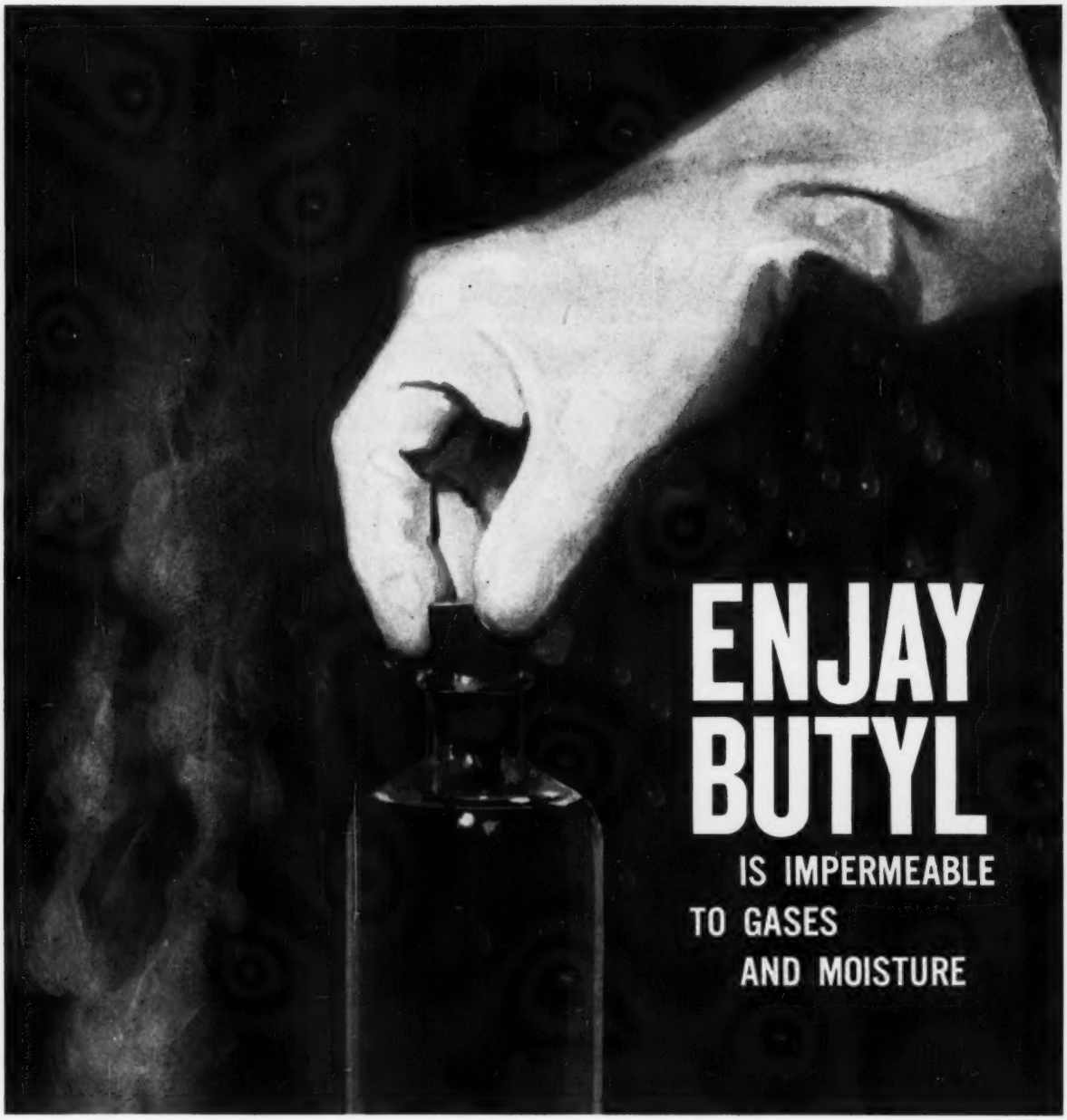
Standard Anaconda copper bus conductor shapes.

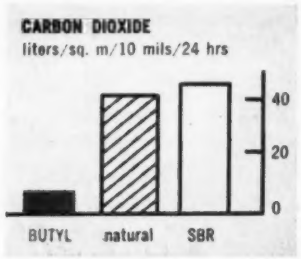
**200,000 KW AT 750 VOLTS** is maximum peak rating of twelve d-c generators providing power for the confining field coils in C Stellarator being built in the new fusion research facility at Princeton University. This power is needed to establish the maximum 50,000-gauss magnetic field, forming the walls around the reaction aimed at reaching 100 million degrees. A.E.C. demonstration model above shows one form of the Stellarator tube that has been considered. The big copper bus (top), 9 square inches in section and silver plated, will carry the tremendous power from the generators to the coils around the Stellarator tube. The American Brass Company has furnished the mile of bus required for the job to specifications of the Allis-Chalmers Manufacturing Co., Milwaukee, Wisc., which is assisting in the design and building of the C Stellarator.

# ANACONDA®

**ELECTRICAL COPPER PRODUCTS**

*Made by The American Brass Company*

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Enjay Butyl rubber offers unmatched impermeability to gases, moisture and moisture vapor. Many applications prove Butyl retains air pressure 8 times better than natural rubber. Butyl outperforms natural and synthetic rubber in such applications as inner tubes, jar and bottle seals, inflatable sporting goods, window seals, hoses...wherever an impermeable barrier is required.

*Butyl also offers* outstanding resistance to sunlight and weathering . . . chemicals . . . heat . . . abrasion, tear and flexing . . . superior damping and unmatched electrical properties.

*Find out how versatile, low-cost Butyl can improve your product. Call or write your nearest Enjay office.*

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EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

**ENJAY COMPANY, INC.,** *15 West 51st Street, New York 19, N.Y.*

*Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa*

**COPPER** ▶ **Copper prices climb; imports threatened.** Anaconda and White Pine raised prices to 31½¢ a lb delivered effective Sept. 9. Some domestic producers held firm at 30¢ for the time being. Foreign copper is selling at 33½ to 33¾¢ delivered close to ports. However, a dock strike expected October 1 would restrict imports and decrease the U.S. supply of copper.

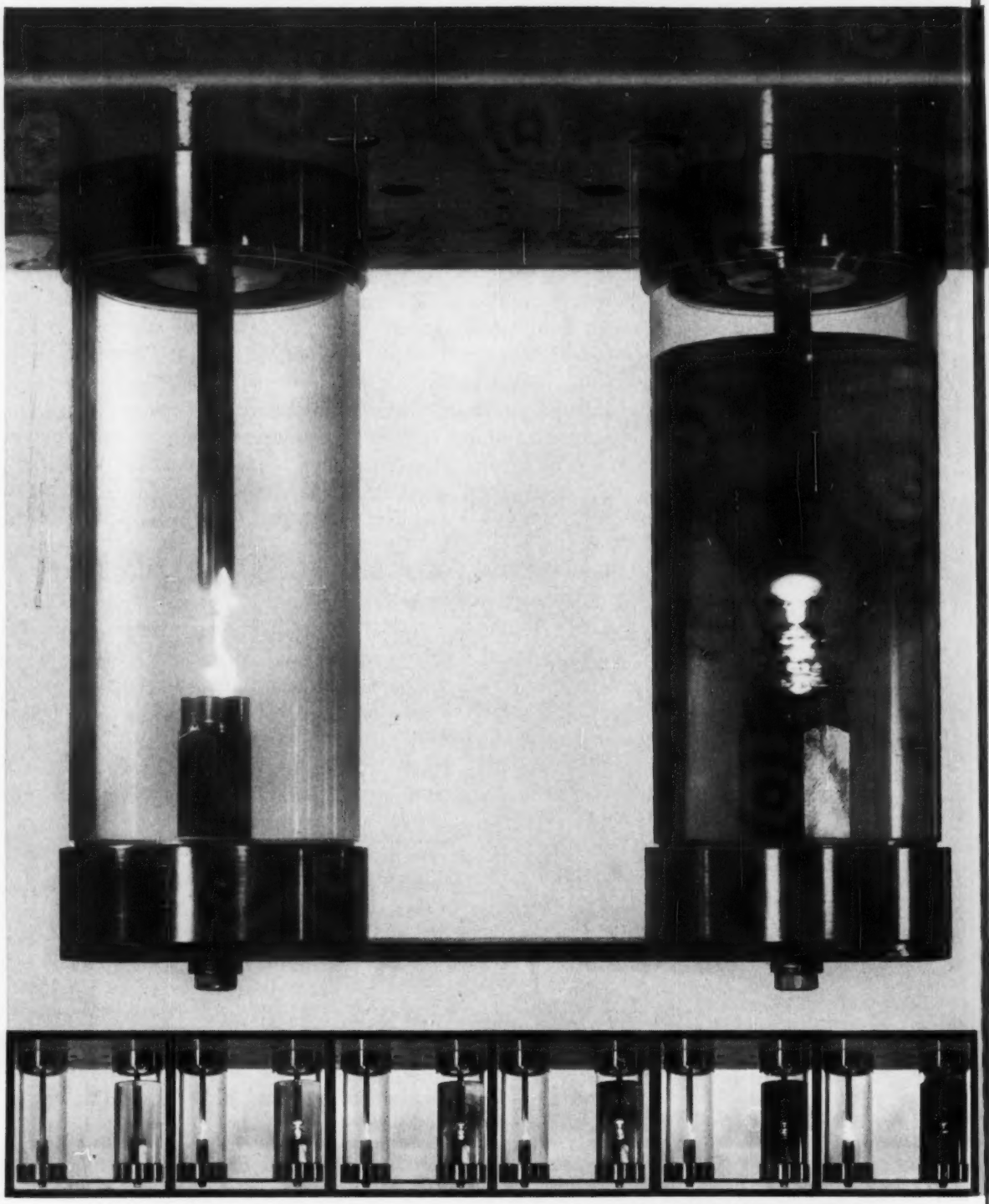
**LEASING** ▶ **Northern States Power Co is leasing extensive radio communications network** from Motorola, Inc. The network will cover 12 operating divisions in Minnesota, North Dakota, and South Dakota. Of the 260 mobile radios to be included, 180 will have fully transistorized receivers and power supplies. Maintenance of the network is being contracted with Motorola under a maintenance agreement. The preventive maintenance and emergency service work will be subcontracted to authorized Motorola service stations throughout the three-state area.

**COAL** ▶ **Anticipating final approval of lower coal freight rates,** fuel buyers along the Eastern Seaboard have begun to shift their buying policies. Coal men are banking on ICC approval of the railroads' plan for cutting bulk rates to reverse the trend that saw utilities' use of oil rise by 58% in New England, and 50% in the Middle Atlantic region during the first five months of the year. During that period, coal consumption slumped by 7% and 3% respectively.

**HEARING** ▶ **Municipal utility purchasing officials may be called to testify** before the Kefauver subcommittee when hearings open later this month in Knoxville, Tenn. The subcommittee is investigating reports of identical bids made on electrical equipment contracts.

**ADVICE** ▶ **Utility purchasing agents offer this succinct advice to salesmen:** Give your best price in your very first bid—don't count on dickering. Of the 15 PA's questioned in recent interviews, all agreed. A midwestern utility PA summed it up for his colleagues: "If a salesman did not give his best bid on the first bid opening, he would not get a second chance." Now and then a vendor will claim a mistake was made and request permission for a second bid. When this occurs, it's policy to give other bidders a second chance, too.

News of Manufacturers ..... page 102
New Equipment ..... page 110
Readers Service ..... page 112



**THIS SIMPLE TEST PROVES $SF_6$ (LEFT) REMAINS UNCONTAMINATED AFTER REPEATED INTERRUPTIONS...WHILE OIL (RIGHT) SHOWS EVIDENCE OF CARBONIZATION**

In this demonstration, $SF_6$ gas has quenched a series of arcs with negligible decomposition, as proved by mass spectrographic analysis of the material before and after the test. The oil, after the same number of interruptions, has carbonized and blackened showing obvious signs of deterioration. This means that the intervals between maintenance operations on a breaker using sulfur hexafluoride gas can be greatly increased.

# $SF_6$ gas stability cuts breaker maintenance

## Makes possible greatly improved performance from 34.5 kv to 460 kv and beyond

High stability of $SF_6$ gas as an arc-extinguishing medium will bring you economies in the operation and maintenance of power breakers never before possible. New Westinghouse $SF_6$ breakers combine many of the recognized advantages of both oil and air breakers, and in some respects are superior to either.

**The great stability of $SF_6$** (sulfur hexafluoride) assures long life of the gas as both an arc-quenching and an insulating medium, even with repeated interruptions. $SF_6$ has extremely high dielectric strength, recovers full dielectric properties rapidly . . . assures unexcelled arc extinction time after time. $SF_6$ is inert, nontoxic, nonflammable, odorless . . . entirely safe. These qualities, plus the quiet operation of the closed $SF_6$ gas system, make $SF_6$ breakers ideal for all substations . . . even in urban locations where noise may be a problem. New Westinghouse $SF_6$ breakers are easier and less expensive to install and to maintain than any power breaker available today.

**Westinghouse power circuit breakers** using $SF_6$ gas are basically new. But they have proved themselves at several voltages and also promise the most practical design avenue in capacities of 460 kv and beyond.

Westinghouse suggests you buy two of these new breakers in widely separated ratings and apply them in entirely different operating situations. Prove to yourself that they will give you combined performance and economy you cannot get in any other breaker.

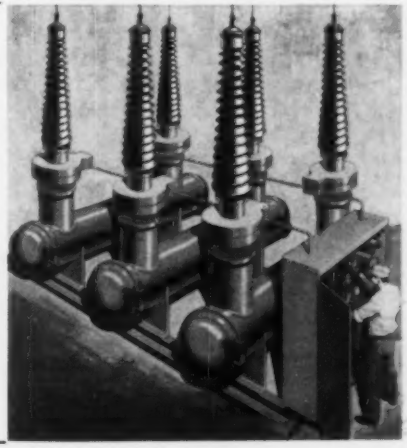
Call your Westinghouse representative today. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-60981

### PROVE THE OUTSTANDING PERFORMANCE OF THIS BREAKER ON YOUR OWN SYSTEM

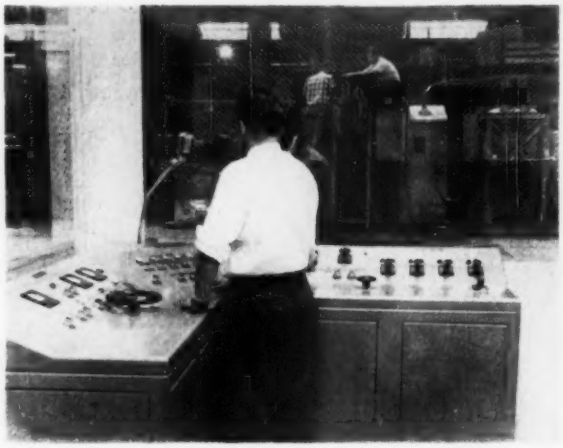
The principle of circuit breaker design using $SF_6$ gas has already been proved successful on several operating systems. Breakers from 46 kv to 115 kv have now completed over two years of service.

With $SF_6$ breakers you get: FAST INTERRUPTION; EASY INSTALLATION; SIMPLE, LIGHT FOUNDATIONS . . . no ground shock during interruption . . . elimination of oil and size reduction cuts weight up to 65% at 230 kv; DRASTICALLY SLASHED MAINTENANCE . . . $SF_6$ does not decompose . . . interrupter easily removed; COMPLETE SAFETY AT ALL TIMES . . . dead tank construction; QUIET OPERATION . . . no discharge to atmosphere . . . closed system conserves gas.

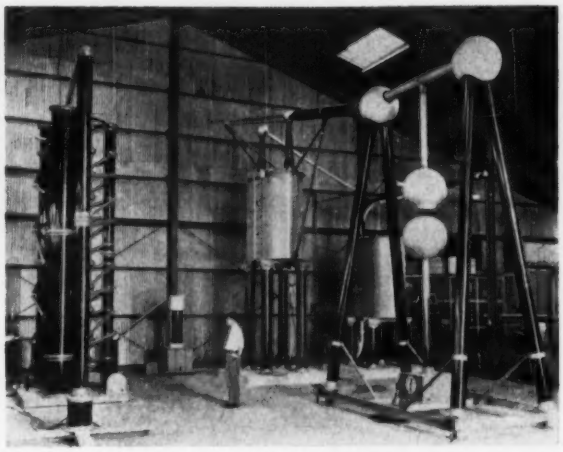


YOU CAN BE SURE... IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS



**HIGH-CURRENT TESTING SETUP** is viewed by Kelman engineer who, from cubicle, can control up to 200,000 amp



**TEST EQUIPMENT** includes a 1.5-Mv surge generator (left); high-voltage transformer supply; and sphere gap (right)

# I-T-E's New Lab Surge-Tests Up to 1.5 Mv

I-T-E has opened a high-voltage development laboratory at its Kelman Power Circuit Breaker Division in Los Angeles which is capable of surge testing up to 1.5 Mv. Incorporated is a high-current testing setup which I-T-E believes is the only testing facility of this kind on the West Coast.

The laboratory will not only provide a key testing tool available to the division for full-time development of new products in its power circuit breaker line, but also will be made available to regional utilities and industrial firms for advanced testing of a wide range of materials and components.

Use of the laboratory will decrease the time required for research and testing from the development stage to actual production and will permit acceleration of general studies of parts, components and materials at higher voltages. The company also plans to carry on in the lab sometime in the future, studies of the development of circuit breakers at even higher voltages, to keep pace with electrical utilities' demands.

Principal items of equipment at the new Kelman lab include test sets purchased from testing laboratories, now disbanded, at Pacific Oerlikon Co, Tacoma, Wash., or at the California Institute of Technology, Los Angeles. Testing equipment includes: 1) Facility for high-voltage power frequency: two transformer units, each producing 333 kv, connected in cascade to provide a total of 666 kv. Input voltage to the transformer equipment is 480 v at 60 cycles. 2) Facility for high-voltage impulse testing: A surge generator duplicating the steep wave front of lightning which, by the discharge of power held in eight condenser sections, can produce a total

(*Continued on p* 106)

## Delta-Star Makes Huge Flex Bus Connectors

Measurements of one of Delta-Star Electric's aluminum flexible connectors for an 11,000-amp, 19-in.-dia tubular aluminum bus are checked out (left) as 28 in. long and 28 in. across the two terminal taps.

Delta-Star made these connectors of all welded construction, except for transformer lead connection, to provide a minimum of current interchange surfaces.

To facilitate field installation, the units were supplied with a short section of aluminum bus, welded into the connectors, permitting a simple tube-to-tube butt weld to be made.

Stud bushing compartments on G&W load break oil switches permit adding new circuits without interruption to existing loads.

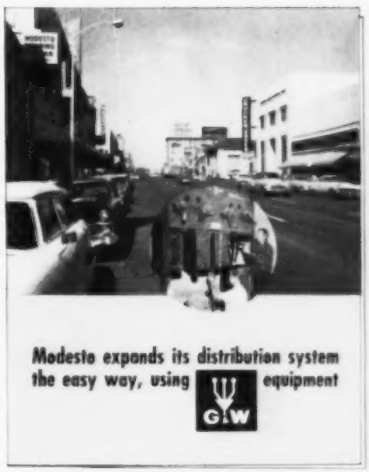
# Small city + big plans = TWO-FOLD ECONOMY

*for underground distribution system*

Sound distribution system planning by engineers of the Modesto Irrigation District in California has paid off handsomely. The system they used was economical to install and economical to expand.

In 1942, when few small cities had 12 kv underground electrical distribution systems, MID engineers began drafting one for Modesto. Work on the new system was started by running feeders from existing 12 kv overhead lines. G&W load break oil switches and oil link boxes simplified installation and provided spare ways for adding new circuits quickly and easily as the city grew. As a result, service interruptions and expense have been kept to a minimum.

Today, after experiencing years of excellent service, MID continues to specify G&W equipment—products backed by long experience, thorough engineering skill and complete manufacturing resources. Consult *your* nearest G&W representative for complete satisfaction on your distribution system problems.




Write for new bulletin giving the full story of the Modesto installation —a down-to-earth job report on how G&W equipment saved time and money.

**G&W ELECTRIC SPECIALTY CO.**

3500 W. 127th Street • Blue Island • Illinois

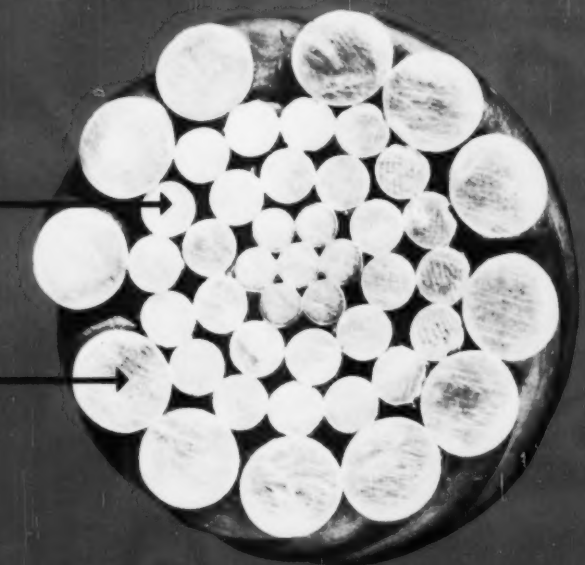
Representatives in principal cities • Canadian Mfr. – Powerlite Devices, Ltd., Toronto

**FULL TENSION SPLICE FOR ACSR CONDUCTORS**

ACSR CONDUCTOR SPLICED WITH PREFORMED FULL-TENSION SPLICE

# *Preformed*™ SPLICES

ALUMINUM CONDUCTOR SPLICED WITH PREFORMED ALUMINUM-GRIP SPLICE




**LIMITED TENSION ALUMINUM-GRIP SPLICE FOR ACSR AND ALL-ALUMINUM CONDUCTORS**

For The Booklet-of-the-Month "WRAP UP YOUR SPLICING PROBLEMS FOR KEEPS"

Patented — U. S. Patent No. 2,609,653; other patents pending

# For full electrical conductivity

# Holds full rated strength of ACSR Conductor

# Resists corrosion

# Compatible with cable materials

ALUMINUM FILLER RODS

GALVANIZED STEEL CORE SPLICE

# "Breathe" with the conductor

# Flex with conductor (EXCLUSIVE WITH PREFORMED)

# Visible certainty of proper installation (EXCLUSIVE WITH PREFORMED)

# Simple application

PLP® *You can look up to* Preformed™

Write to **PREFORMED LINE PRODUCTS COMPANY**
**DEPT. SP-1**
5349 St. Clair Avenue, Cleveland 3, Ohio

## I-T-E's New H-V Lab

(*Continued from p* 102)

of 1.5 Mv. The sections are charged in parallel by a 200-kv rectifier, then connected in series for discharge. 3) Facility for high-current testing: Test set consisting of an arrangement of transformers which provide up to 200,000 amp at low voltage for various short-time current tests on all types of switchgear. Primary voltage is 20 kv.

Equipment for design tests such as heat runs, mechanical operation, and material checks will also be housed at the lab.

The new 8700-sq-ft test facilities are in a high-bay building which is part of Kelman's plant.

## Square D Moves Hq's; Opens Research Dept

Square D Co will move its corporate executive offices to Chicago's suburban Park Ridge from its present location in Detroit by next summer. The new site was chosen because it is more central and convenient.

The new 43,000-sq-ft plant, costing more than $1 million, will serve as headquarters for the corporate offices and staff and will include corporate research facilities for the first time. The new corporate research department will concentrate on long-term developments in the fields of control systems, motor control apparatus, and electrical distribution equipment.

## GE, Farben Team Up on Polycarbonate Polymers

A cross-license agreement under United States patent rights of each company in the field of polycarbonate polymers has been executed by General Electric and Farbenfabriken Bayer of Germany, both independent developers of polycarbonates.

The materials represent an entirely new class of polymers which exhibit high impact strength, excellent dimensional stability, superior heat resistance, and good electrical properties, according to GE. Discovery stemmed from a program of basic polymer research seeking better high temperature organic materials for insulating and structural applications.

The license agreement is expected by GE to accelerate research in the fields of molding compounds, films, extrusion materials, coatings, fluids, and elastomers.

## B-B, Westinghouse Receive Seattle Contract

Seattle City Light has ordered from Westinghouse and Brown-Boveri equipment to convert its Canal receiving substation.

Westinghouse will furnish two 75,000-kva, three-phase transformers for $398,200 to reduce power from 115 to 26 kv. Brown-Boveri will furnish thirteen 34.5-kv oil circuit breakers for $223,500. The equipment is specified for delivery in 1960.

The conversion, scheduled for completion in the fall of 1960, is part of the system-wide elimination of 55-kv transmission and 13-kv sub-transmission. Power now is received at 115 kv and reduced first to 55 kv, then to 13 kv.

## Hagan Chemical Acquires Milwaukee Firm

Hagan Chemicals & Controls has acquired the Bruner Corp., a Milwaukee manufacturer of water-treating equipment, to operate as a wholly-owned subsidiary.

The Bruner firm has plants in Milwaukee and Los Angeles, producing sump pumps, water softeners, filtration equipment, and secondary recovery plants in oil fields. Sales of Bruner are expected to hit $6 million this year.

## IEC Publishes Specs on H-V Switch, Control Gear

High voltage switchgear and control gear are treated in two new publications of the International Electrotechnical Commission which are now available through the American Standards Association.

IEC Publication 56-1-A contains two additions to IEC Specifications for Alternating Current Circuit Breakers. These are: recommendations for unit testing by direct methods of circuit breakers for making and breaking capacity; and methods of determining inherent restriking voltage waveforms.

IEC Publication 56-3 contains Rules for Normal Load Conditions including: definitions, rules for rating, rules for test, and coordination of rated voltages, breaking capacities and normal currents.

The publications are available from the ASA, Dept PR 96, 70 East 45th Street, New York 17, N. Y. Prices are $3.60 for 56-1-A and $3.20 for 56-3.

## General Instrument Forms New Division

General Instrument has formed a new thermo-electric division as the first move in an attempt to capture "a substantial share" of the market for thermo-electric devices, predicted by the company to reach $100,000,000 in five years.

Initially, the new division will occupy a 10,000-sq-ft section of GI's headquarter's plant in Newark, N. J. Within a year, fifty scientists are expected to be at work on research and development projects.

## Gibbs & Hill to Design Small Nuclear Power Plant

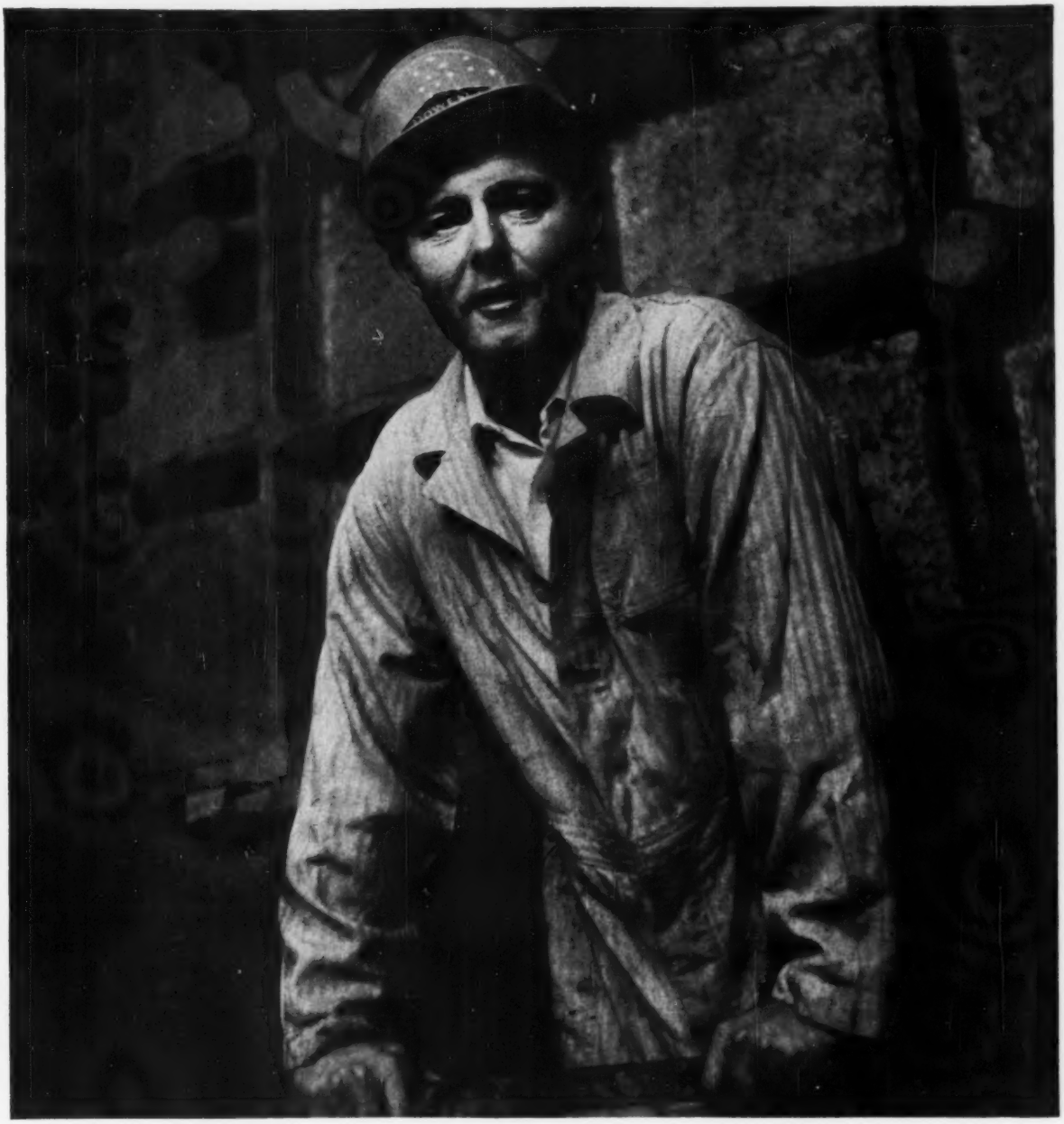
The Atomic Energy Commission has announced the selection of Gibbs & Hill to design a small pressurized water nuclear power plant. According to the AEC, the engineering firm's services will include conceptual design for the steam producing portion of the plant and an option for detailed design of the nuclear portion, excluding equipment design of the reactor which will be procured separately.

The proposed plant will be designed to produce 16,500 kw of electric power. With installation of an optional conventional superheater, its capacity could be increased to 22,000 kw.

Construction of the plant is expected to begin about May, 1960, with 1962 completion scheduled.

The AEC announced plans for the reactor on Aug. 4, and invited proposals from cooperatives and public power organizations.

(*More Procurement & Products p* 110)



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This is a Dowell Service Engineer. He is an expert in the use of chemical solvents to remove scale and sludge from your process systems, boilers, tanks and piping.

Using the exclusive Dowell methods of chemical cleaning, this engineer can free up the profits that these deposits cut from your operating ledger.

More than 15 years experience in all industries—for example, oil refining, chemical, steel, public utilities and paper—give Dowell engineers full knowledge of the problems of cleaning plant equipment.

Add to this experience the benefits you get in special equipment, chemicals, research and trained people.

Put this ability and experience to work for you. Let the Dowell man engineer a profitable chemical cleaning program for you. Dowell—the largest, the oldest, the most experienced chemical cleaning service—Tulsa 1, Oklahoma; and 165 stations and offices in major industrial centers.

***Chemical cleaning service for all industry***

DOWELL

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DOW | HERBICIDES

# Save money, time and trouble.

Off-season, basal application of Esteron® 245 O.S. is the safe, efficient, economical way to get lasting control of troublesome vegetation along right-of-ways. This rapid kill, chemical vegetation control helps utilities keep a clear line to customers . . . keeps the way clear for inspectors and repair men.

Applying a direct spray of Esteron 245 O.S. to the base area of vegetation gives prolonged control of brush, upland hardwoods, and so-called problem species, including ash. This basal method of application is especially desirable along distribution lines adjacent to public roads and highways. It eliminates the sometimes objectionable and unsightly

# spray during the off-season with

# ...Esteron 245 O.S.

"browning" caused by foliage sprays.

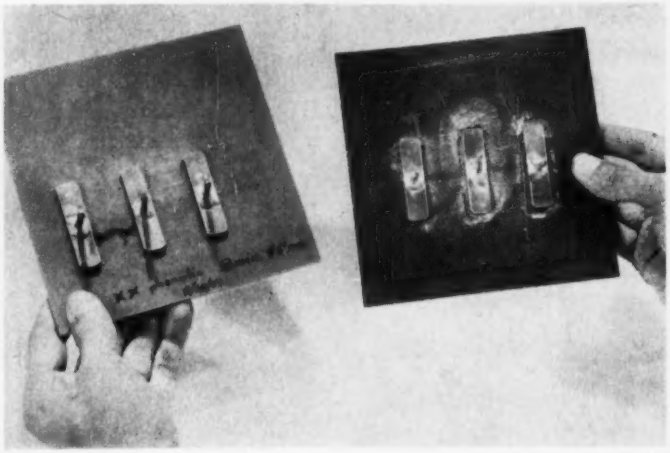
Control of brush and weeds during an off-season is particularly safe. There are no growing crops to damage. And, application costs are lower when your spraying contractor isn't rushed. You are assured of better vegetation control in a shorter time . . . and at a saving.

Whenever . . . wherever you're faced with unwanted vegetation, you can depend on Dow brush and weed killers. For detailed information on low cost Esteron 245 O.S. or any of the other Dow vegetation control chemicals, write to: THE DOW CHEMICAL COMPANY, Industrial Section, Agricultural Chemicals Sales Dept. 204BA9-21, Midland, Michigan.

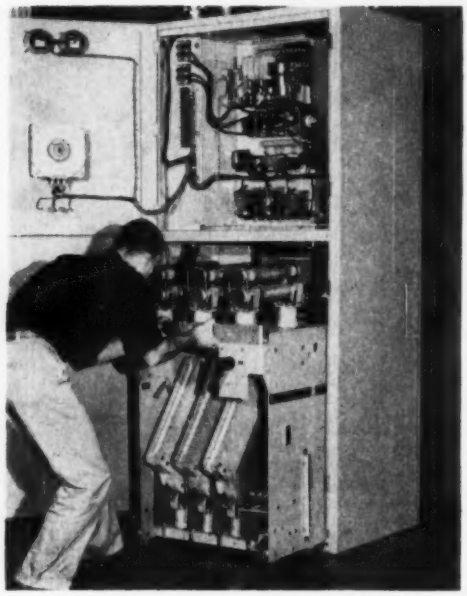
**THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN**

(For further information refer to Readers Service on page 112)

## Insulation . . .



**. . . for service in contaminated, humid atmospheres** is track resistant. Called "Resistrac," the laminate can be used in apparatus operating at voltages over 1 kv. Under proposed ASTM Dust-Fog Tracking Resistance test procedure, the sample at right showed no tracking after 207 hr. The phenolic laminate at left failed by carbon tracking in less than 9 min.
**Glastic Corp, 4321 Glenridge Rd, Cleveland 21, Ohio.**



## Motor Starter . . .

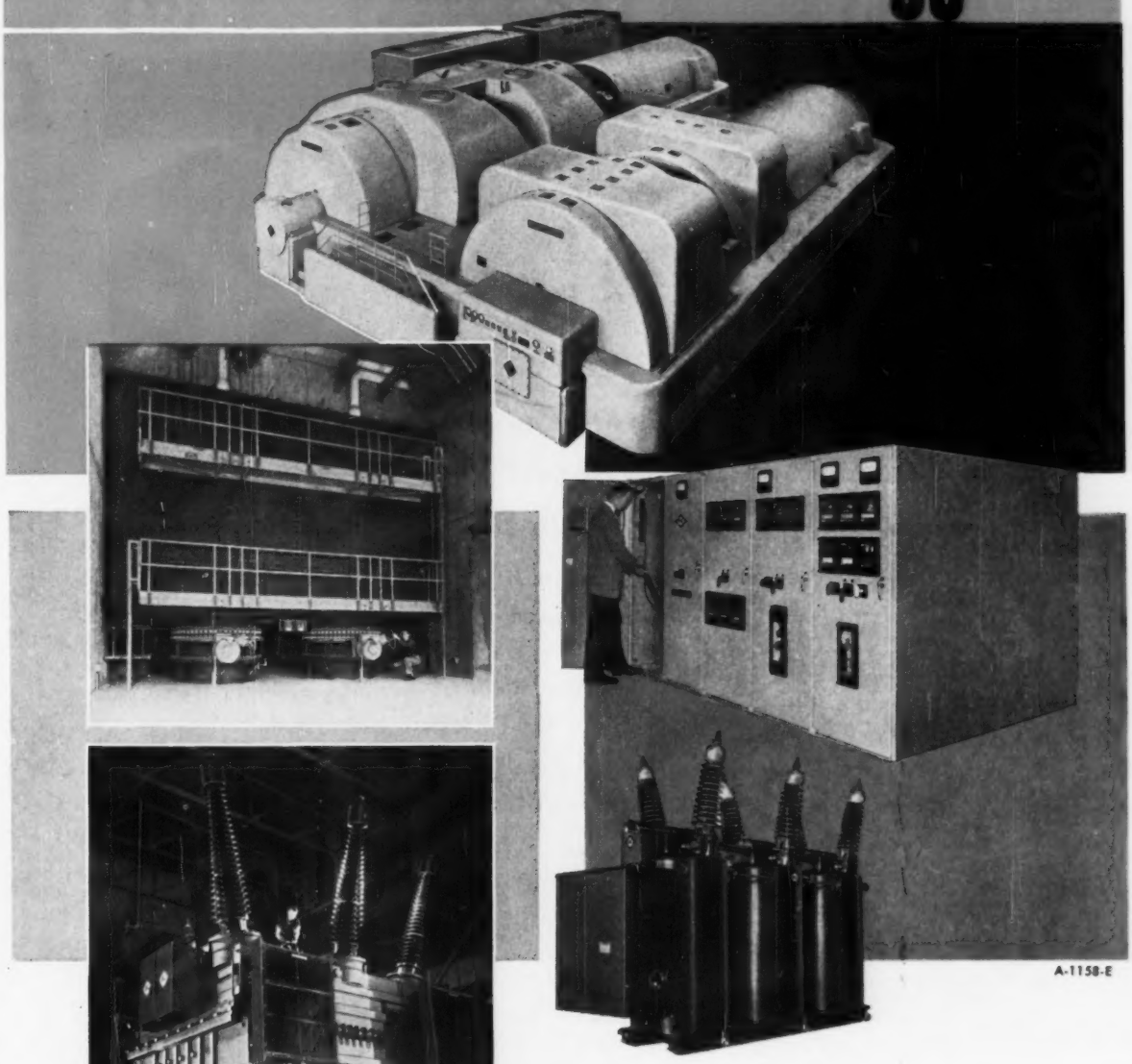
**. . . provides short-circuit protection** and coordinated control for squirrel-cage, synchronous, and wound-rotor motors up to 3,000 hp rated from 2,300 to 4,200 v. Called Limitamp Control, the re-designed controller features a new draw-out contactor and fuse-shelf assembly. The unit is designed for severe or highly repetitive operating conditions requiring minimum maintenance. Rolling out the combination contactor and fuse-shelf assembly is an easy one man job.
**General Electric Co, Schenectady 5, N. Y.**

## Differential Relay . . .

**. . . has all static protective circuit functions** providing protection from damage due to 3-phase, phase-to-phase, 2-phase-to-ground, and phase-to-ground faults. The Type SA relay has a minimum operating current of 0.14 amp through one restraint circuit and the operating circuit in series. No auxiliary transformers are required; the relay is connected to conventional current transformers. At 5 amp, 60 cycles, the burden on each CT in the generator leads is 0.25 va.
**Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.**

(*More New Equipment on page* 114)

ALLIS-CHALMERS modern line for '59



A-1158-E

# Modernize

## to build system efficiency

A continuing program of electrical equipment modernization is one of the most successful approaches to cost reduction. The *degree* of cost reduction depends upon unit efficiency. Allis-Chalmers equipment has built a world-wide reputation for achieving *higher* system efficiencies created through research-born design advantages!

**ALLIS-CHALMERS**

*For detailed information on Allis-Chalmers efficiency-boosting advantages, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.*

# Readers Service

**For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:**

**NEW EQUIPMENT**

Glastic ..... Insulation ☐
GE ..... Starter ☐
Westinghouse ..... Relay ☐
Malleable Iron ..... Gain ☐
GE ..... Meters ☐
Louis Allis ..... Motors ☐
Precision Magnetic ..... Adapter ☐
Houghton ..... Epoxy ☐
Watson ..... Tailgate ☐
Joslyn ..... Clevis ☐

**OTHER**

_____

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**SEPTEMBER 21, 1959**



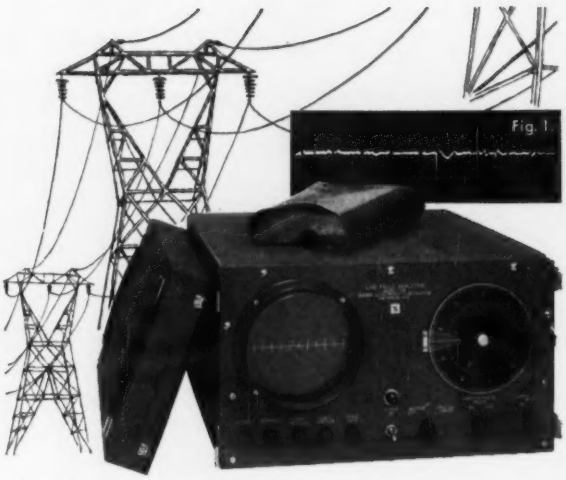




Figure 1. Display of 60 Kv line grounded at 27 miles.

## Locate circuit faults exactly ...½ to 200 miles distant

**Communication and power lines**
**Use on any open wire line**
**Direct reading, simple to use**
**Use at carrier terminal, powerhouse, sub-station**

Shorts, grounds or opens up to 200 miles away can be located within a few yards with the improved Sierra 124A Line Fault Analyzer. The instrument, operating on radar principles, sends a high amplitude pulse along the line under test. Discontinuities, even capacitors and transformer banks, appear clearly; a complete picture of the line and its condition appears on the radar-type "A" scope.

### Two Pulse Widths

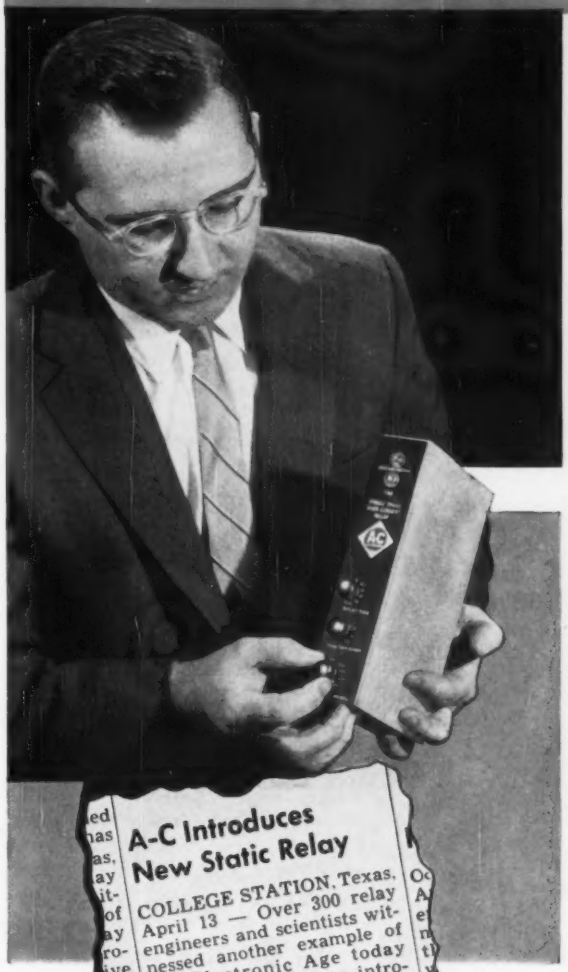
To insure maximum readability, two pulses — a 1 microsecond, 1,000 volt pulse or an 8 microsecond, 500 volt pulse —are provided. Other features include a sweep delay, movable distance step, sweep repetition rate of 60 cps and a high intensity flat faced cathode ray tube. Provision is made for camera attachment to the scope face.

Bulletin gives details, actual utility operating experiences

Data subject to change without notice.

**Sierra Electronic Corporation**
*A subsidiary of Philco Corporation*
4695W Bohannon Drive • DAvenport 6-2060
Menlo Park, California, U.S.A.
Sales representatives in Major Cities
Canada: Atlas Instrument Corp., Ltd., Toronto, Montreal, Vancouver, Winnipeg
Export: Frazar & Hansen, Ltd., San Francisco, New York, Los Angeles

ALLIS-CHALMERS modern line for '59



## A-C Introduces New Static Relay

COLLEGE STATION, Texas, April 13 — Over 300 relay engineers and scientists witnessed another example of the Electronic Age today when Allis-Chalmers introduced a new static protective relay. The new development was disclosed in an engineering paper presented by John Baude, Allis-Chalmers engineer, before the Twelfth Annual Conference for Protective Relay Engineers.

The new relay, designed for industrial switchgear application, is the first major departure from conventional relay construction in 50 years.

**NO MOVING PARTS**

Of particular significance is the elimination of all moving parts through the use of semi-conductors such as transistors, diodes, thermistors, and varistors. Use of these components combined

# FIRST

## completely static protective relay!

**. . . available in Allis-Chalmers switchgear**

This highly reliable *new* protective overcurrent relay has no moving parts . . . it's static, and it's only ⅓ the size of conventional relays.

Employing transistors, printed circuits, and other electronic components encased in epoxy-resin, A-C static relays are shock and moisture resistant They're unaffected by temperature changes, operate with low burden, and have instantaneous reset feature. Quick plug-in construction makes replacement easy.

*Want more protective relay-equipped switchgear facts? Contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.*

A-1157-E

**ALLIS-CHALMERS**

**GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE**

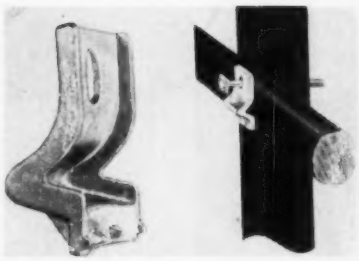
The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

**Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.**

*Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."*

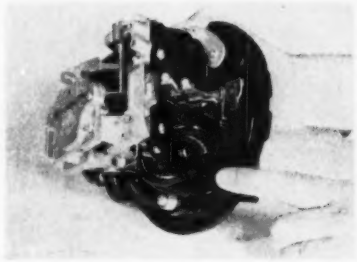
INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

## Crossarm Gain . . .

**. . . offers lower installation** and maintenance costs when used with round distribution arms on single pole construction. The pole arm contacts face and shelf surfaces of the gain and the lower portion of the gain offers wedge action against overturn and vertical movement.
**Pole Hardware Div, Malleable Iron Fittings Co, Branford, Conn.**

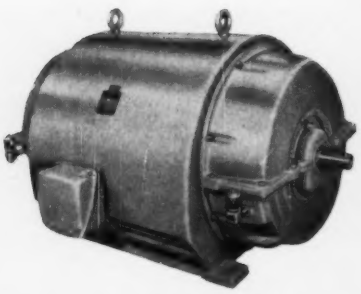


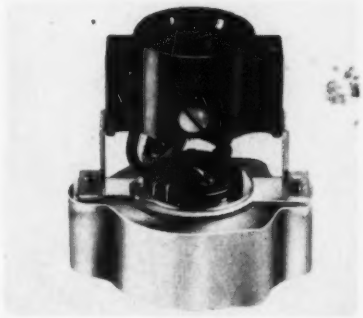
## Polyphase Meters . . .

**. . . in two new models** measure polyphase loads up to 200 amp without instrument transformers. Designed for 4-wire delta operation, the V-66 has a rated speed of 8⅓ rpm with 60-amp turns in the current coil. It has a watthour constant of 28.8, a register ratio of 6 17/18, and a maximum temperature rise of 55C at 200 amp. The V-65 meter is designed for metering 3-phase wye circuits.
**General Electric Co, Schenectady 5, N. Y.**

## Induction Motors . . .

**. . . in open drip-proof enclosures** are available in ratings from 150 to 2,000 hp at 1,800 and 3,600 rpm. The motors are designed for applications requiring higher horsepower, constant speed motors. Bronze inserts are used in the bearing capsule to achieve close tolerance running fits between capsule and shaft.
**Louis Allis Co, Dept P, Milwaukee 1, Wis.**





## Adapter . . .

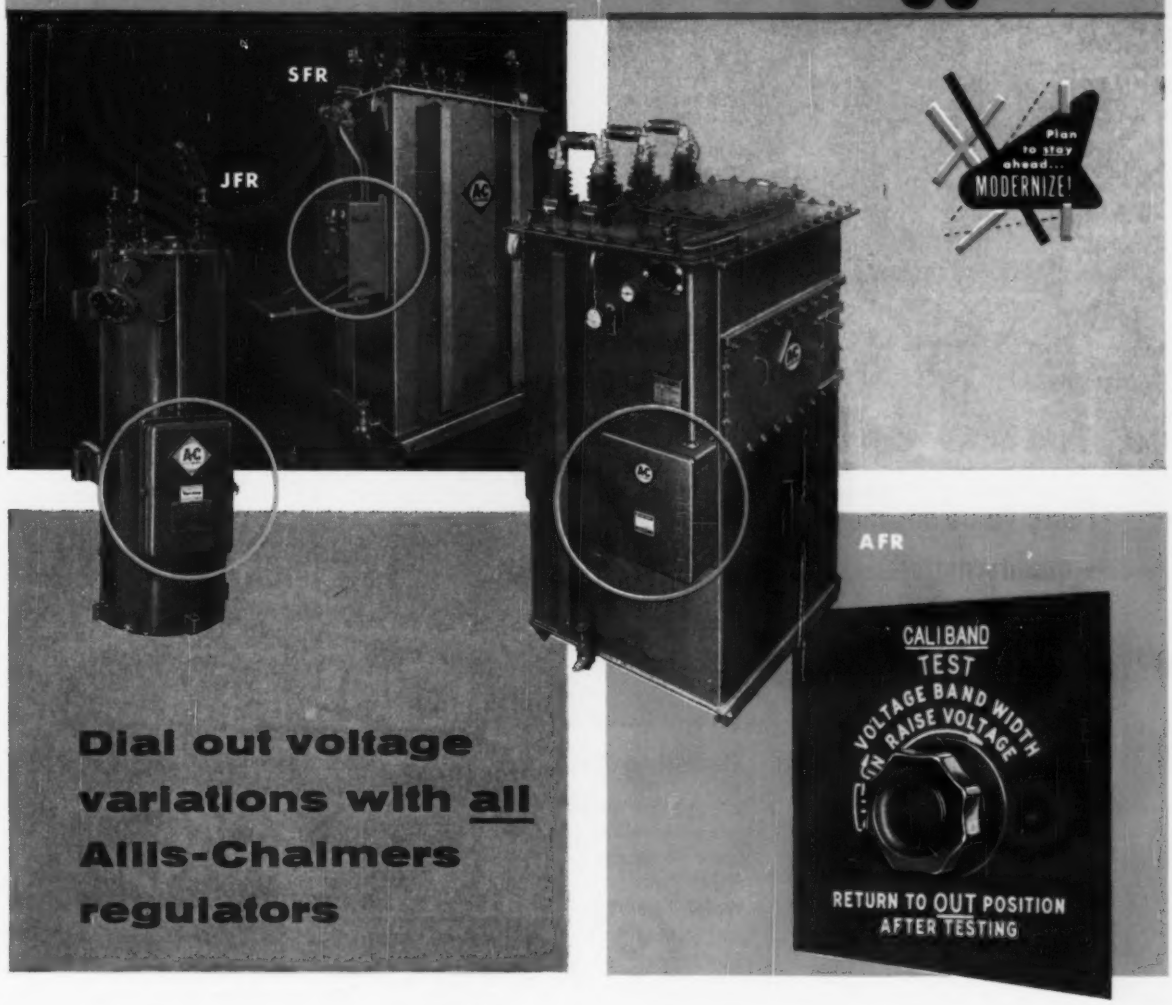
**. . . permits twist-lock photoelectric controls** to be used in 3-prong Amphenol type plugs. The A-1 Adapter allows any kind of twist-lock control which does not have an overall height of more than $2\frac{13}{16}$ in. to be used in straight prong installations.
**Precision Magnetic Controls, Inc, Ridgewood, N. J.**

## Epoxy Compound . . .

**. . . is applied by simple "butter technique"** without dripping or run-

*(Continued on page 116)*

## ALLIS-CHALMERS modern line for '59




**Dial out voltage variations with all Allis-Chalmers regulators**

### New Caliband regulator control gives you precise settings with a twist of the knob...ends customer complaints

*Caliband* is an Allis-Chalmers trademark.

*Caliband* control gives you complete freedom to test and accurately set voltage level and band width. There's no interruption of regulated service, no changing of customer voltage. Just a simple twist of the knob does the job.

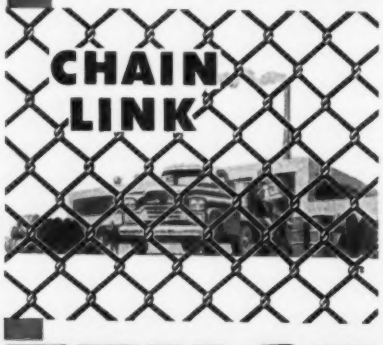
**CALIBAND control demonstrated**

A call to your nearby A-C office will bring an engineer and a *Caliband* control demonstration kit to your desk. Or, write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

**ALLIS-CHALMERS**
*Originators of 5/8% Step Regulators*

A-1156-E

PAGE




FENCE

Fence value depends on
–quality materials
–quality installation
You get both from PAGE

New Aluminized Fabric!
(other quality fabrics available:
galvanized steel,
aluminum,
stainless steel)

8 basic fence designs
6 gate styles

Expert installation
by specialists

Registered Certificate
of Quality furnished
to property owner

Good fences–since 1883

*Write for helpful booklet*

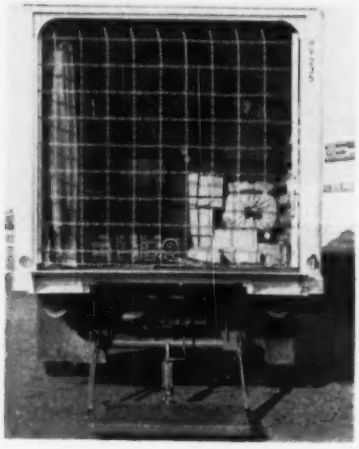
**PAGE FENCE ASSOCIATION**
National Headquarters • Monessen, Pa.

A product of Page Steel & Wire Division
American Chain & Cable Company, Inc.

## Epoxy Compound . . .

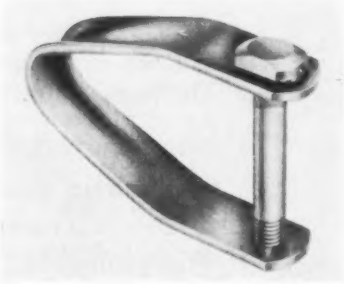
(*Continued from page* 114)

off during application or cure. Hysol 10-55 is a two-component system which is mixed 1 to 1 by volume. It protects motor stator windings against moisture, dirt, abrasives, chemicals and other contaminants.
**Houghton Laboratories, Inc, Olean, N. Y.**



## Elevating Tailgate . . .

**. . . folds under truck or trailer body** to allow direct contact by body bumpers against a loading dock. Known as the Watson Weightlifter "Hide-A-Gate," it lifts and loads up to a 1,200-lb payload. The tailgate is hydraulic and mounts to 1½-ton and larger trucks.
**H. S. Watson Co, 1316 67th St, Emeryville 8, Cal.**



## Clevis . . .

**. . . has self-locking threaded bolt** that positively links top and bottom arms of clevis together. Tightened easily with a standard wrench, the bolt head fits into a recess in the clevis arm. The feature is available in the JO440 Spool Clevis, the JO422 Swivel Mounting Clevis and the J255 Secondary Pulley Bracket.
**Joslyn Mfg and Supply Co, 155 N Wacker Dr, Chicago 6, Ill.**

## *More New Products*

Model IG-10K **ignitron tester** tests all common ignitron tubes wherever line voltage is available. Operating potential range is up to 10,000 v ac.—Alectric Mfg Co, 7842 39th Ave, Kenosha, Wis.

NEMA Type 12 **panel enclosures** feature two Z-bar supports welded to enclosure walls. This permits secure bolting of wired panels from the front without stud shearing or stripping.—Michigan Controls Co, 8790 Grinnell Ave, Detroit 13, Mich.

**Silicone rubber** compounds, RTV-120 and RTV-160, cure at room temperature in a few minutes to form resilient sponge.—General Electric Co, Silicone Products Dept, Waterford, N. Y.

Duck bill **plier** is designed to reach into confined places. The 8-in. Model Catalog No. 315-8 may be purchased with tips knurled or plain.—Mathias Klein & Sons, 7200 McCormick Rd, Chicago 45, Ill.

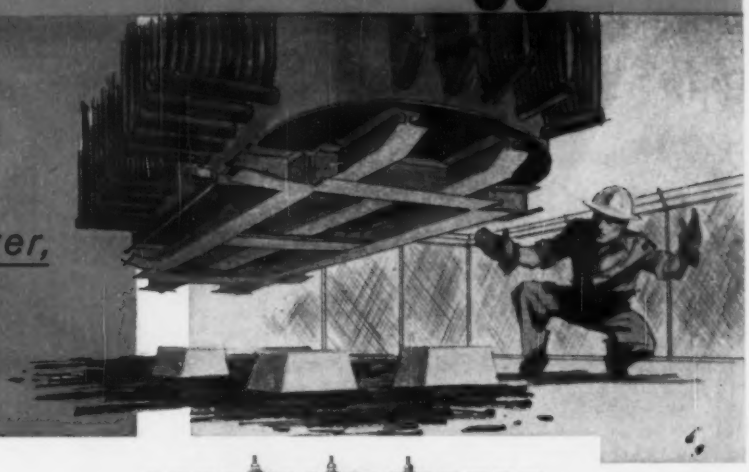
**Thermocouple head assembly** with "Flip-Top" cap features ease of installation. The ceramic block will take wires from No. 8 to the smallest sizes.—Pyrometer Co of America, Inc, Penndel, Pa.

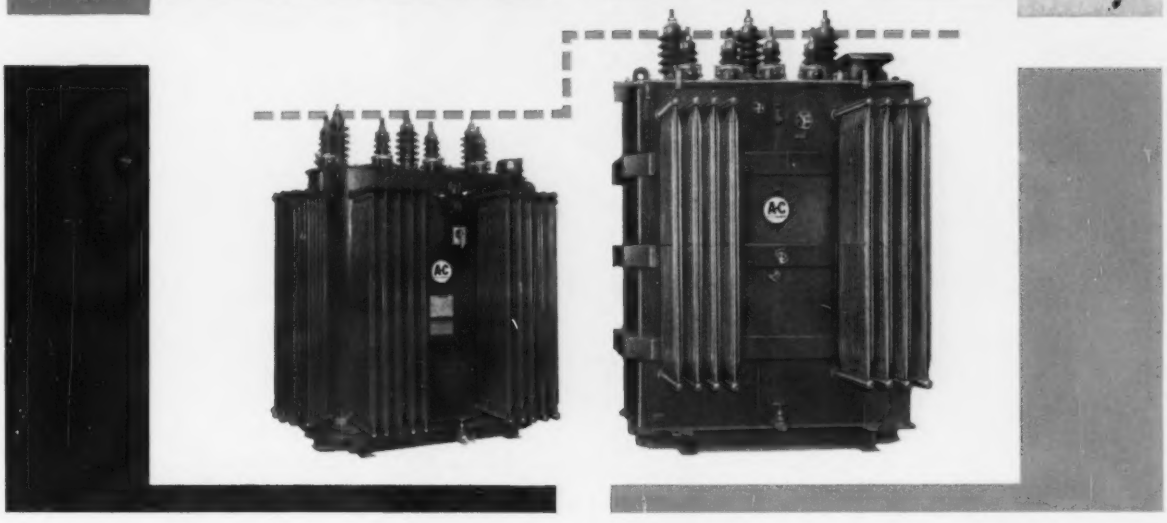
**Dial thermometer** reads up to 1,100F. Known as Model TMF, it features field replacement of elements.—Partlow Corp, 524 Campion Rd, New Hartford, N. Y.

Mechanically held **dc relay** adds to line of Type D relays for pilot control. Coils are available in a variety of voltages.—Square D Co, 4041 N Richards St, Milwaukee 1, Wis.

ALLIS-CHALMERS modern line for '59

*Easier to install because they're 30% lower, lighter too!*





# NEW
# Allis-Chalmers small power transformers

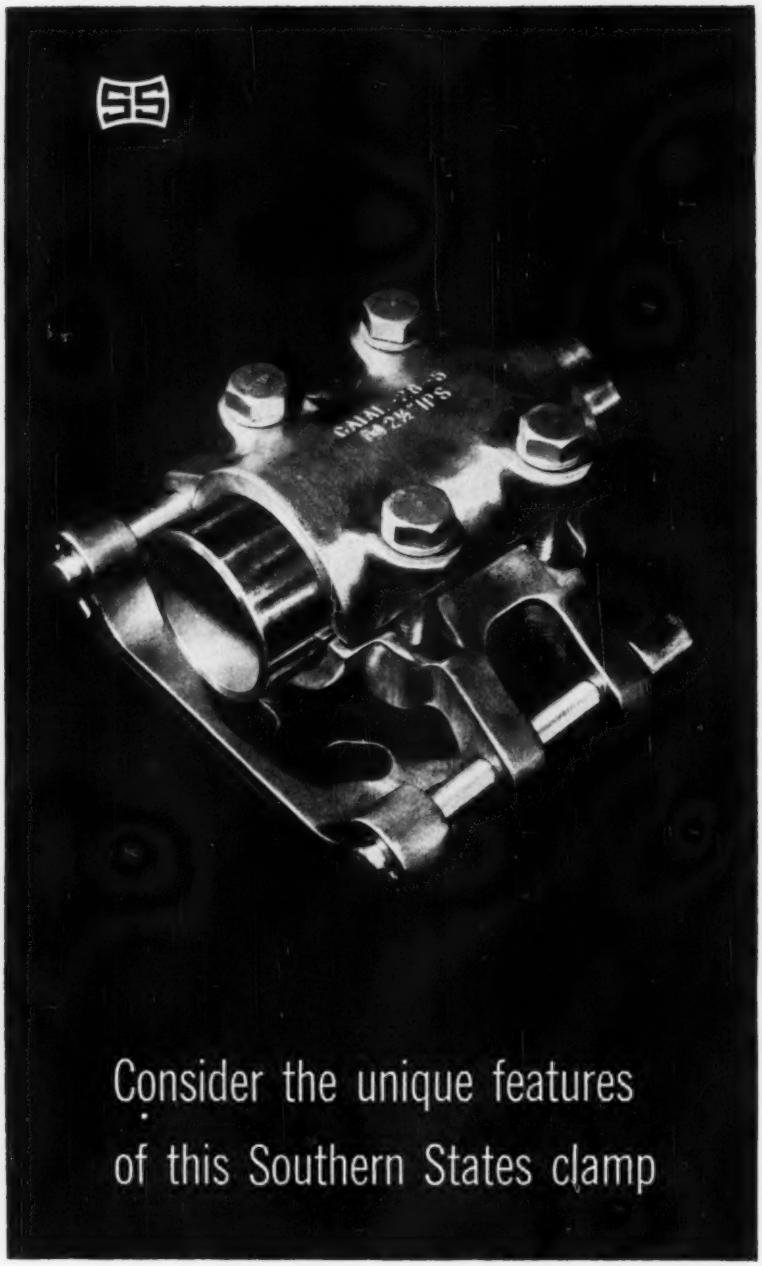
Goodbye to building high-cost foundations — engaging extra-heavy-duty handling equipment — all to install "small" power transformers.

**All new** — these lighter, lower units by Allis-Chalmers bed down on a thinner pad, low cost piers or concrete planks. Handling is simplified by the weight-saving design. (The 34.5-kv, 3750-kva transformer, for example, has had its weight reduced by 8000 lbs.)

**Easier servicing** is another basic advantage of this new design that also reduces losses, exciting current and noise level. The unit is reinforced from the inside, offering a smooth, clean appearance — no disfiguring, dirt-gathering external bracing.

Get the complete story from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

**ALLIS-CHALMERS** A-1179-E




This exclusive design offers many advantages in a sliding bus support clamp: two stainless steel excursion rods... wide support to provide high cantilever strength... movement in only one direction — no pivoting or side chatter... heat-treated, high strength aluminum... anodized bolts. The Type CAIAL is another example of Southern States engineering.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

## 12 Trends in Transmission

(*Continued from page* 81)

A deviation from the basic trends described in this article is the use of split-high-voltage systems with loops and radial configuration instead of solidly interconnected high-voltage systems. Also, at least one important system deviates from these basic trends by the use of single-circuit loops and of single-phase line-to-ground faults as the criterion for stability. With such a loop system there is less for using a type of fault more severe than line to ground.

### Conclusions

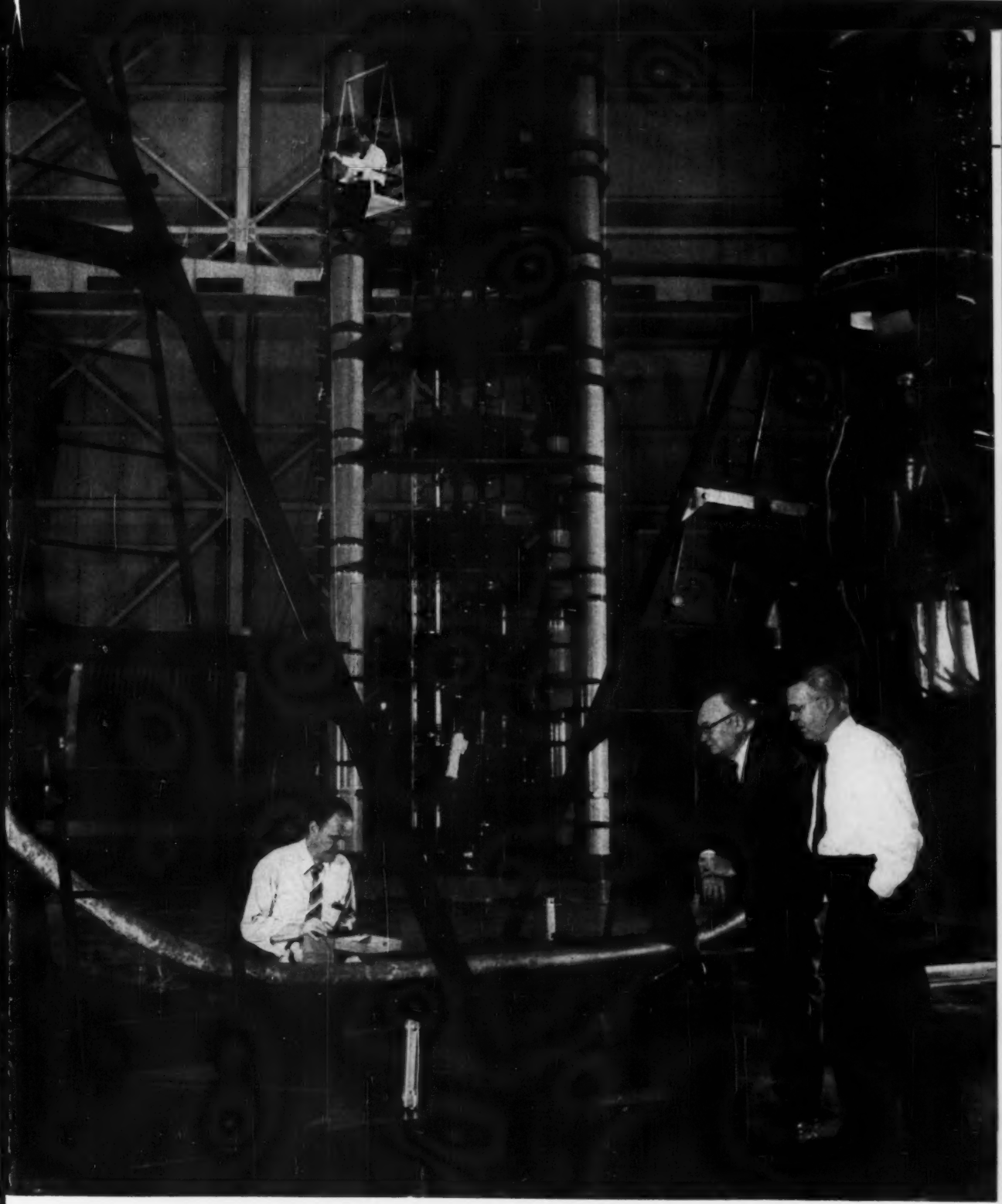
**1.** The predominant type of high voltage electric power system is interconnected at the high-voltage terminals and uses high interrupting capacity circuit breakers with quick fault-clearing and reclosing times. This type of system was developed as a result of analysis and experiment in the building of low-cost high voltage systems over the past 25 years and has become standardized now by usage.

**2.** Deviations in system design from the basic trends can result in the possibility of using lower interrupting capacity circiut breakers, moderate fault clearing times, and line-to-ground faults as the criterion for stability. Such systems are characterized by loops as contrasted with the parallel arrangement of the usual design. However, this loop type of system is now becoming extinct at the higher voltages in the United States.

*The author wishes to acknowledge the contribution of his associate, Mr. C. Concordia, in the publication of this article.*

## No. 4 for Mine-Mouth Plant

Kentucky Utilities Co has added 100,000 kw to its Green River steam plant near Central City, Ky., with completion of unit No. 4. Its location in the coal fields, with no freight charges for fuel, help to give Green River No. 4 the lowest production costs in the KU system, the company says. Utility mine-mouth plants becoming more common.



**NOW, THE NATION'S MOST MODERN**
**EXTRA-HIGH-VOLTAGE CABLE AND ACCESSORIES**
**DEVELOPMENT LABORATORY**
**IS BEHIND THE MAN FROM ANACONDA**

*Anaconda's new Extra-High-Voltage Laboratory—*

# AN "IMPROVING" GROUND FOR TODAY'S HIGH-VOLTAGE CABLE

Looking from the control room at Anaconda's Extra-High-Voltage Laboratory, you can see some of the equipment which helps make this the most modern laboratory of its type in the nation.

Lightning *does* strike twice in the same place.

Lightning—3 million volts of it—is a regular occurrence on the Impulse Generator in Anaconda's new Extra-High-Voltage Laboratory at Hastings-on-Hudson, New York. It generates enough voltage to break down any known cable. More than that, this generator is a symbol, an example of the vast extra-high-voltage (EHV) facilities which enable Anaconda engineers to duplicate *actual in-service* conditions—to find out how today's cable can be improved to deliver more power more efficiently.

Most powerful "improving" facility is the cyclic load testing. Cable samples aren't short lengths employed in ordinary lab work—aren't heated by trick means and don't have high resistance conductors. They're full-sized commercial cables, heated by actual load current in the conductor and energized continuously with voltages 150% of rated. The equipment tests cable up to ratings of 5400 mva (5 *billion* watts —more than New York City uses!).

# A PROVING GROUND FOR TOMORROW'S EHV CABLE AND ACCESSORIES

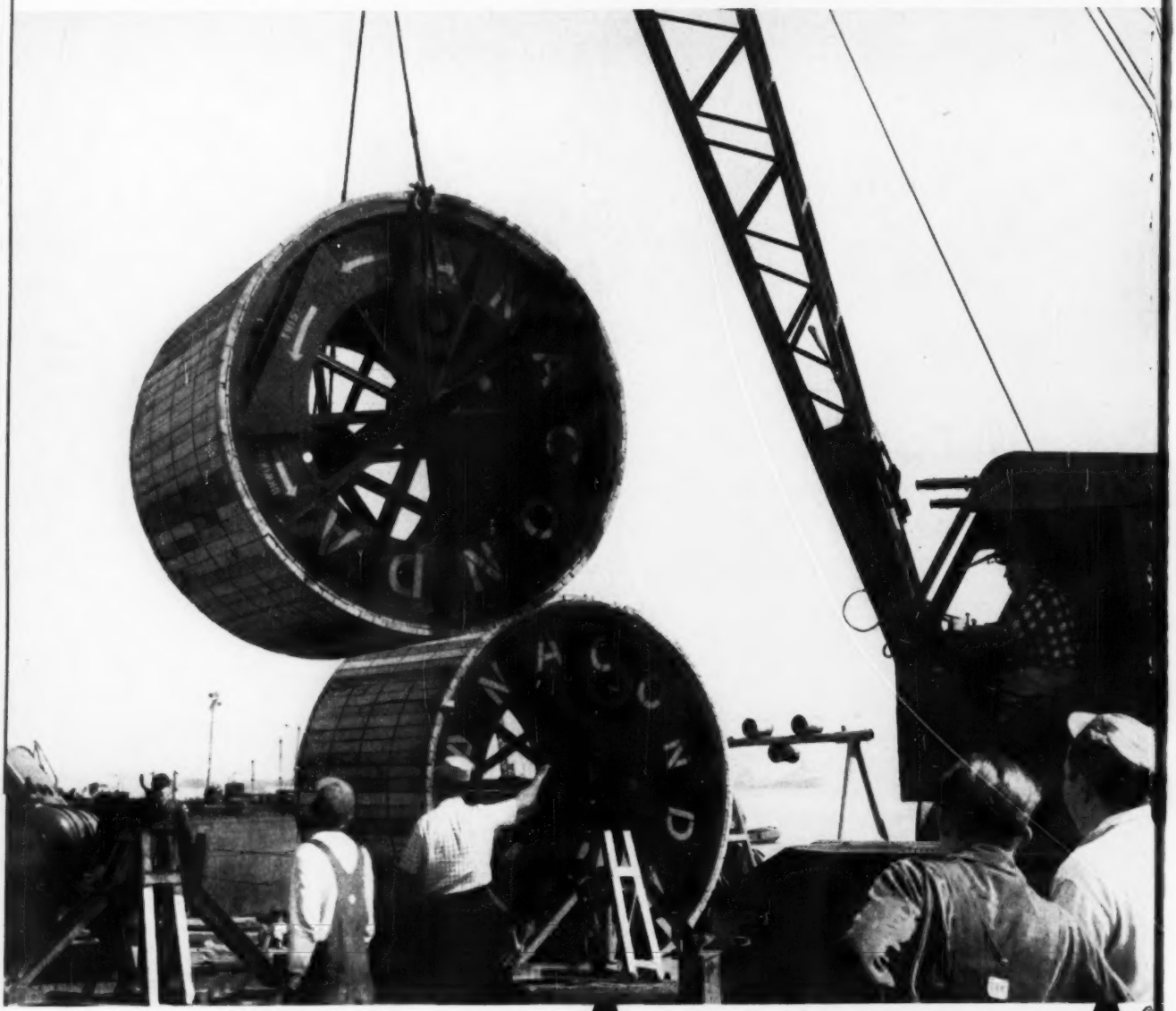
Here you see an essential step in the development of an Anaconda accessory—full-scale and exacting electrical testing.

When it becomes necessary to go underground —due to lack of urban space—the solution is high-voltage cable, 138 kv and 230 kv today, 345 kv—even higher tomorrow. Right now, Anaconda engineers are developing the cables and accessories for tomorrow's anticipated demands and higher voltage requirements.

As every engineer knows, high-voltage cables must be jointed with extreme care—in extra-high-voltage cable installations, it is mandatory that jointing and terminating be so designed as to be just as reliable as the cable itself. That is why Anaconda has been designing and building accessory equipment—for over thirty years.

*Turn the page to see Anaconda Cable going into another new installation.*

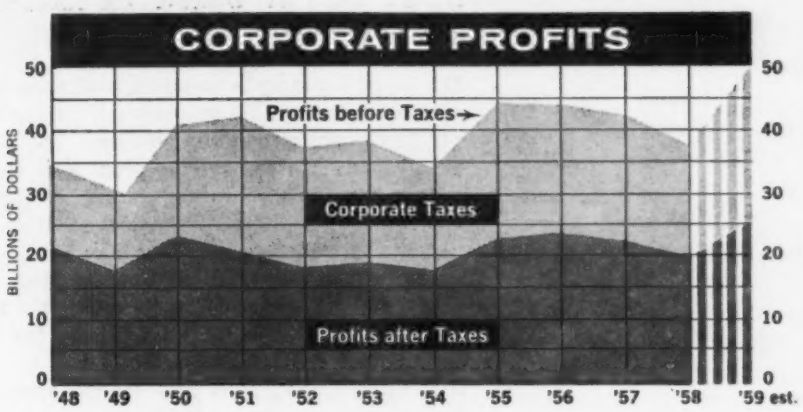
# ANOTHER UTILITY LOOKS TO TOMORROW BY INSTALLING ANACONDA HIGH-VOLTAGE CABLE TODAY




Anaconda 138 kv cable being delivered for installation by Consolidated Edison of New York—another step in the planned expansion of this utility to keep ahead of electrical demands in the growing dynamic area they serve.

**ANACONDA®**

**WIRE AND CABLE COMPANY**




**With a sharp rebound from last year's low point . . .**

# '59 Profits Head for Record High

Report on
**Electrical Business Outlook**

**Corporate profits this year should set an all-time record,** at around $50 billion before taxes and about $25 billion after taxes. In fact these levels are practically a sure thing unless the steel strike drags on well into the winter. The annual rate of profits for the second quarter came close to $50 billion, and, although the strike will depress third-quarter earnings for some important industries, the final quarter is expected to show a rebound that will push profits to another high. If they do reach $50 billion for the year, corporate profits (before taxes) will have shown a rise over 1958 of well over 30%.

**This rise in profits is a good sign, although not an exceptional one** in a year that has been graced by all-time highs in industrial production, Gross National Product, and personal income, and all-time lows in the purchasing power of the dollar. Nevertheless, since $50 billion is a nice, round figure that looks good in headlines, the chances are that you will be hearing a great deal about record profits during the next few months. Therefore, it would be a good idea to consider these impressive figures in perspective. A careful look at them shows:

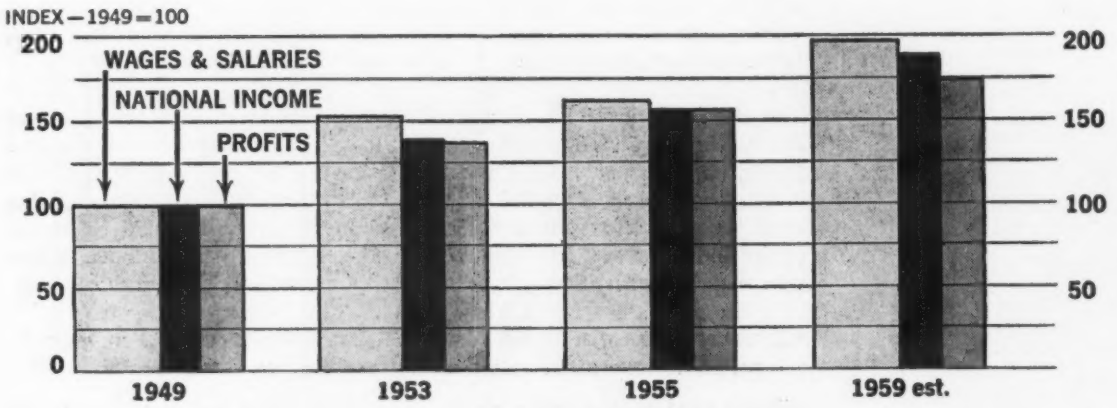
- **Profits as a percent of the sales dollar still stand below the average** for the postwar period, in spite of the record-breaking total figure.
- **Profits have risen considerably less than labor wages and salaries** over the past ten years.
- **Profits, even at the $50-billion level, will scarcely be adequate** to serve as a basis for financing industry's needed expansion and modernization expenditures during the decade ahead.

**What does this new record for profits really mean?** Basically, it means that our system of private incentives is working well. Business activity is at an all-time high in 1959, and high profits are one manifestation of this. They indicate the strength and efficiency with which business is providing a record volume of goods and services. Unfortunately, the high level of profits will also become the basis for arguments that business is getting away with murder at the profit line. One conventional form for the expression of this contention is that the proper thing to do with profits is to put them into circulation via wage increases—

at once jacking up consumer purchasing power and providing assurance that next year's profits will be held down to more "respectable" levels. Indeed, evidence of a large year-to-year rise in profits seems to serve as a *prima facie* case that profits are "excessive" and places on industry the burden of proving that they are not.

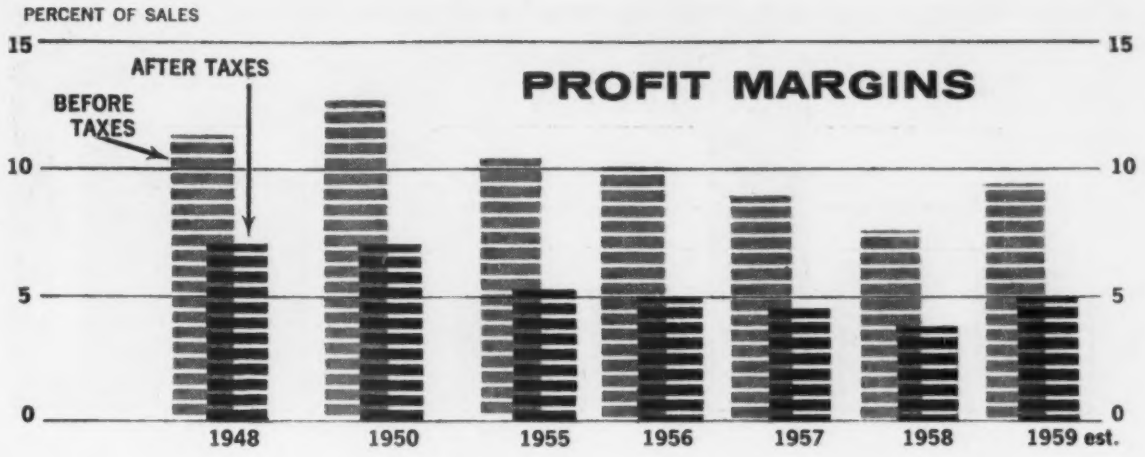
**This year's big jump in corporate profits can be misleading.** Quantitative comparisons of first-half '59 with first-half '58 profit performances don't mean much, but they produce some big numbers. The First National City Bank of New York reports that the average profit after taxes of 808 corporations rose by no less than 56%, led by the textiles industry with a 338% rise, automobiles with 196%, steel with 153%, and railroads with 125%. Actually, the tremendous springs these industries have taken reflect most of all the low ebb to which their profits had fallen during the pit of the recession. Some corporations, which operated at a loss during the first half of 1958, could claim an infinite profit rise because they have since jumped into the black.

**A meaningful comparison involving this year's profits** would have to look back further, at least as far as 1955—the most recent year of strong recovery from a recession—and should go back at least a decade. Furthermore, not all profits as reported represent usable cash for business. Some profits turn up on a company's books simply because inflation has increased the price of goods held in its inventory, but these show up as a small part of the $50-billion total and should be adjusted out. Finally, the comparison should also show some yardstick against which to measure the relative increase of profits. Such a comparison is shown in the chart below.




**Since 1949 profits have grown less rapidly than total national income,** and a great deal less rapidly than wage and salary income. Assuming the expected $50-billion profit level for 1959, corporate profits before taxes (and corrected for "inventory profits") have risen by about 75%. Total national income has risen by about 85% in the same period, while wage and salary income has gone up by nearly 100%. And wage and salary income has advanced steadily, while profits have taken some fairly violent swings up and down.

**At expected levels, profits will account for about 12% of national income** in 1959. This is a larger slice of the pie than in 1957-58, but less than in earlier post-war years. A few representative percentages tell the story: In 1957 and




1958 profits came to only 10.7% of national income, but in 1955 and 1956 profits were 12.5%, and in 1947 and 1948 they were 12.9%.

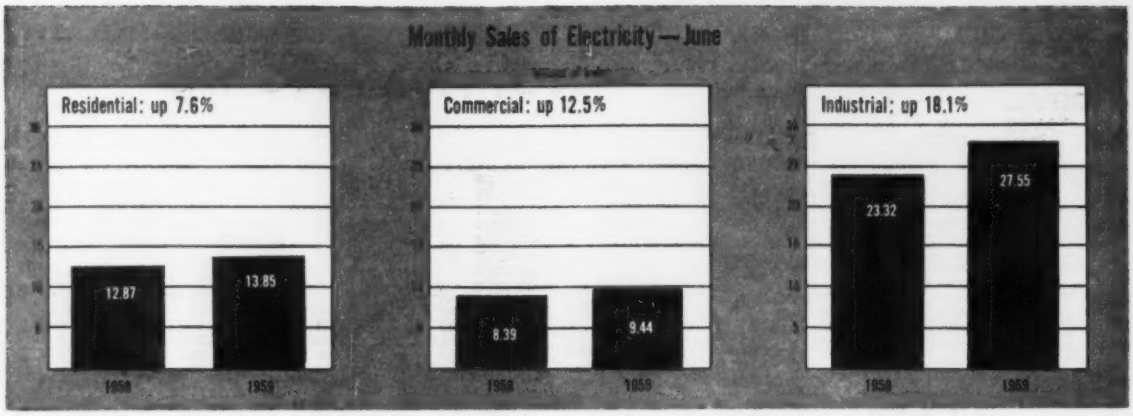
**The same trend shows in industry's profit margin.** Profits per sales dollar are up in 1959, but not up to previous levels. The chart at the top of this page shows industry's 1959 profit margin after taxes at its expected level of 5%. This is a substantial recovery from the recession level of 1958, but it is still below the level of 1955 and well below 1948 and 1950 profit margins. There's no question about it: This year's upturn in profits has been a good one, but it falls far short of being monumental.

**And profits have increased no faster than the need for them.** Industry's bills for new plant and equipment are rising, too, and more money will be needed to pay them. As an average in the next five years, corporations will need about $47 billion a year to support capital investment—$20 billion to replace obselete plant and equipment, $27 billion to provide new facilities and working capital for expansion. In 1959 corporations have about $41.5 billion, and retained profits account for not much more than one-fourth of the total.

**The paradox of a profit-motivated economy** that feels that it must apologize for high profits might best be explained by the psychiatrists. The fact is that the AFL-CIO has already launched its attack on this year's rising profits, and the chances are that over the next few months a great deal of talent will be devoted to finding ways to bring them down again.

The issue was raised in the August issue of *Economic Trends and Outlook*, a publication of the AFL-CIO Economic Policy Committee. Said the committee: "The exceptionally sharp rise in corporate profits of the past fifteen months is a danger to the continued, forward movement of the national economy in the years ahead. Too great a portion of the rise in total national production since the recession low-point has gone to corporate profits. This situation presents a threat that the economy's ability to produce may once again far outpace its ability to consume."

**Actually, the present level of corporate profits is far from exceptional,** when you consider it in relation to the total volume of business being done, or in relation to trends in profits and wages over the past decade. Furthermore, this level of profits—and substantially more—will be needed to help finance an adequate program of industrial expansion and modernization in the years ahead.



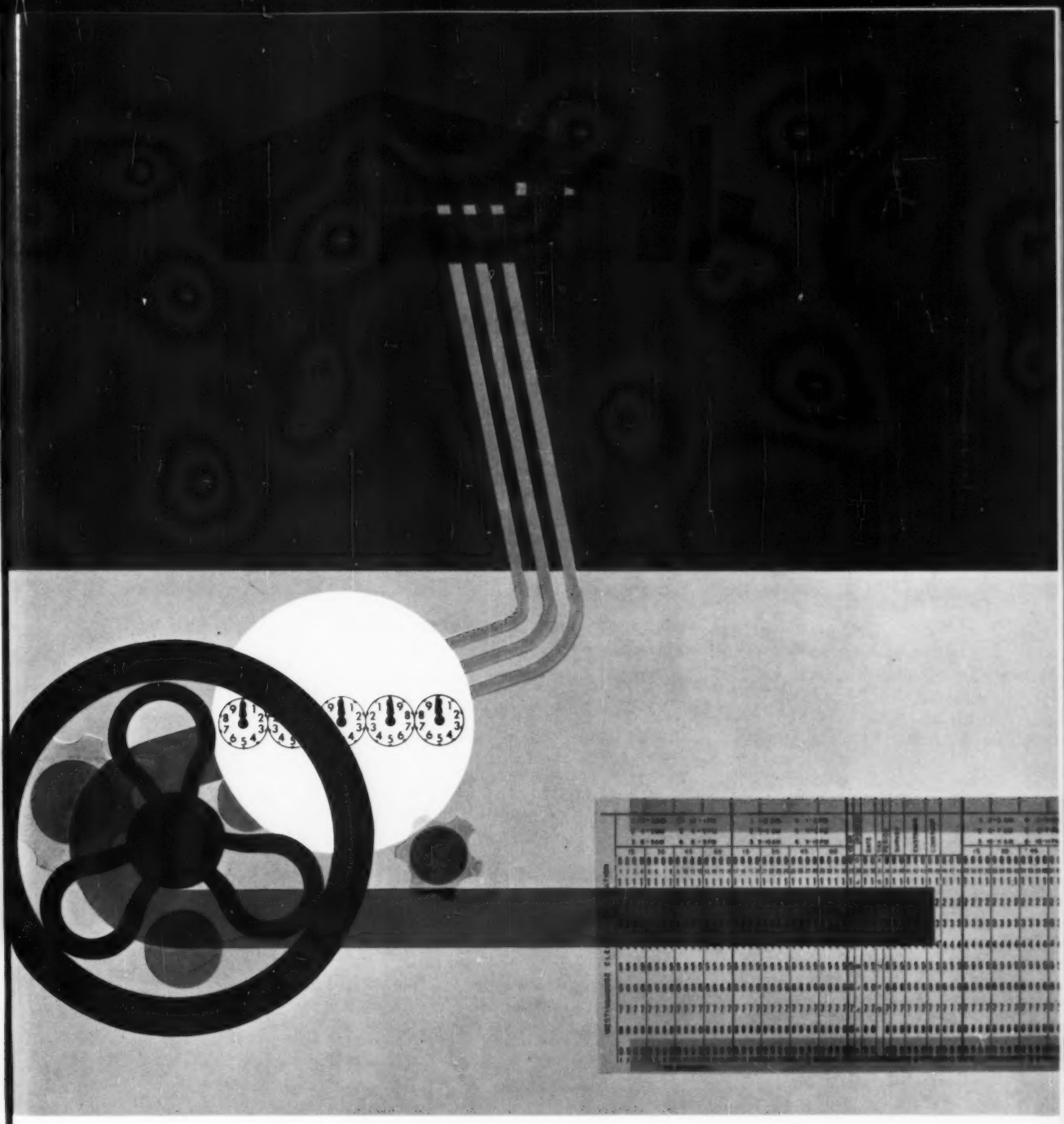

## Power Statistics

| | | Latest Month | Year Ago | Annual Change % |
|---|---|---|---|---|
| Capacity | June | 150.22 | 134.33 | 11.8 |
| Peak—Class I Systems (million kw) | Dec. | 107.1 | 102.4 | 4.6 |
| Estimated Dec. '59 Peak (million kw) | June | 124.7 | 128.0 | −2.6 |
| Production—billion kwhr | June | 59.84 | 51.93 | 15.2 |
| Hydro | | 11.25 | 11.58 | −2.8 |
| Fuel | | 48.59 | 40.35 | 20.4 |
| Sales—billion kwhr | June | 53.84 | 47.27 | 13.9 |
| Residential | | 13.85 | 12.87 | 7.6 |
| Commercial | | 9.44 | 8.39 | 12.5 |
| Industrial | | 27.55 | 23.32 | 18.1 |
| Other | | 2.99 | 2.69 | 11.2 |
| Fuel Consumption | June | | | |
| Coal—million tons | | 13.49 | 11.40 | 18.3 |
| Oil—million barrels | | 5.89 | 5.34 | 10.3 |
| Gas—billion cu ft | | 169.37 | 138.64 | 22.2 |
| Net Income Class A & B Co's—$ million | June | 125.77 | 117.21 | 7.3 |
| Residential Customers—millions | 12 mos | 48.17 | 47.04 | 2.4 |
| Revenue per kwhr | ended | 2.52¢ | 2.53¢ | −0.4 |
| Avg kwhr per customer | May 31 | 3,437 | 3,277 | 4.9 |
| Avg annual bill | | $86.61 | $82.91 | 4.5 |

## Business Statistics

| | | | | |
|---|---|---|---|---|
| Indexes: 1947–49 = 100 | | | | |
| FRB Industrial Production | Aug. | 147 | 136 | 8.0 |
| ENR Construction Cost | Sept. | 170.3 | 162.2 | 5.0 |
| BLS Cost-of-living | July | 124.9 | 123.9 | 0.8 |
| New Orders for Machinery (1950 = 100) | July | 169 | 145 | 16.6 |
| NEMA Sales | | | | |
| Insulation materials | July | 131 | 90 | 46.0 |
| Electric appliances | | 114 | 99 | 15.0 |
| Wholesale prices | | | | |
| Motors and generators | June | 145.9 | 146.5 | −0.4 |
| Transformers and regulators | | 149.7 | 147.6 | 1.4 |
| Switchgear and fuses | | 178.9 | 173.8 | 2.9 |
| GNP—annual rate—$ billion | 2nd Qtr | 484.5 | 434.5 | 11.5 |

**Significant changes:** In June, NEMA's index of wholesale prices of motors and generators registered its first year-to-year decline in almost four years. The last such dip took place in August 1955.



# Cut load survey costs two-thirds

**With Westinghouse Load Survey Recorders:** Westinghouse Load Survey Recorders now put fast, accurate and economical load research methods within the grasp of all utilities, regardless of size. Continuing changes in system loads emphasize the need for accurate data on utility load characteristics. Efficient load building, based on sound load factor data, is as valuable as savings realized through more efficient generation.

Survey reports enable you to pinpoint sales promotion efforts in those areas where desirable additional load can be added. Ask your Westinghouse sales engineer to show you how Westinghouse Load Survey Recorders can help improve revenues on your system. Watch Westinghouse meters for the Bonus Value Beyond Specifications.

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

# CHECK THESE EXCLUSIVE WESTINGHOUSE LOAD SURVEY RECORDER BONUS VALUES

**House-quiet operation**
(Absolutely silent, cannot disturb homeowners)

**Lowest cost, most efficient survey device available**
(Readily adaptable to all meter applications—with or without socket)

**Can be adjusted to 15-30-or 60-minute demand intervals**
(Capable of operating at full meter load)

**600-ft tape capacity-¼-in. standard**
(Mylar* backed tape is resistant to heat and humidity. Enough for 32 days—reusable indefinitely)

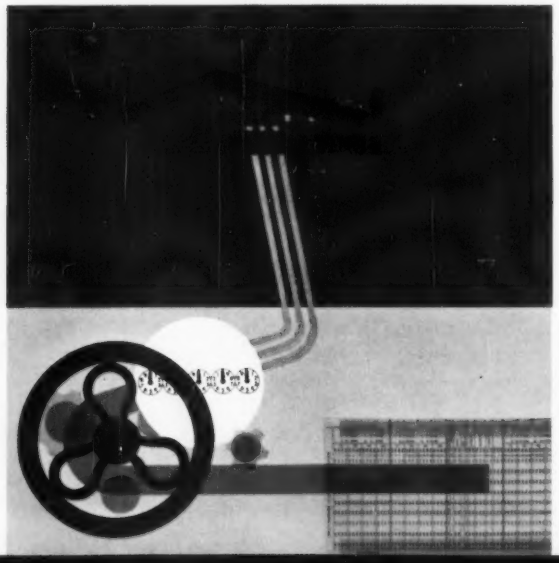
**"Playback" of all data can be put on either standard IBM cards or paper tape**
(Permanent time and demand record, including survey data, date, meter constant, etc.)

**Fully automated tape translation**
(Eliminates tedious and time-consuming clerical work)

**Pull-out, Plug-in installation**
(Lightweight, compact construction. No special permission or wiring required)

Watch the mail for this brochure, or get one from your Westinghouse sales engineer. It explains how Westinghouse Load Survey Meters operate, and how they can save money for you.

*DuPont registered trade-mark



YOU CAN BE SURE...IF IT'S

Westinghouse

JI-40495

**ROADS LEADING** to Central Maine Power Co's new service building are lined with various types of street lighting equipment. Customers are shown the differences between major types of lighting sources and mounting arrangements

# Central Maine Shows Different Street Lights

Central Maine Power Co has set up a selling tool for customers who need and want to be shown just what good street lighting is.

It's a demonstration area, constructed along roads surrounding the company's new Augusta service building, to show what different lighting installations can do for the customer. It provides city and state officials, civic club members, and others, with actual comparisons of various lighting sources and mounting arrangements.

The streets total 3,736 ft in length and provide separate demonstration areas for filament, fluorescent and mercury luminaires applied to typical whiteway and traffic streets. Pavement widths vary from 18 to 98 ft and mounting heights from 27 to 30 ft. All luminaires were manufactured by the General Electric Co.

There are 45 fixtures visitors can study to compare three types of filament luminaires, mercury units from 3,500 to 21,000 lumens, and two- and four-lamp fluorescents in both four- and six-ft sizes ranging from 2,700 to 37,200 lumens.

The demonstration area was decided on when the company's new service building was completed last year. Alton T. Littlefield, vice president and manager of the utility's division operations, reports, "So many of our cities and towns were interested in seeing street lighting demonstrations that we decided an area of this type would be of mutual help to our customers and the company."

With Augusta virtually the center of Central Maine's 8,500 sq mi service area, 90% of the utility's more than 230,000 customers can easily reach the demonstration area.

The area has been a direct sales help, according to Ray McFarland, director of Central Maine's lighting division. "It provides us with a tailor-made means of actually showing visiting officials just exactly what they can expect from each different type of lighting. They can see just exactly how bright their streets will be after lighting installations are made," McFarland says.

Planned night tours for service club members, municipal officials, and others from various communities have been conducted for more than 200 specifically interested individuals.

(*More Selling on p* 130)

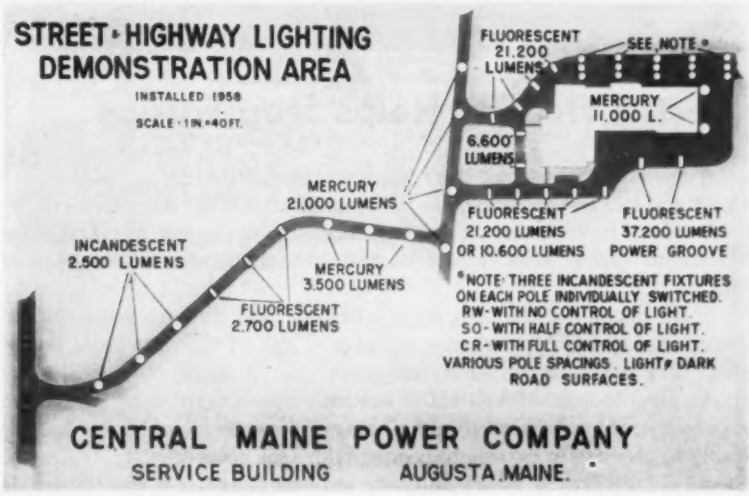

STREET • HIGHWAY LIGHTING DEMONSTRATION AREA
INSTALLED 1958
SCALE · 1 IN. = 40 FT.
FLUORESCENT 21,200 LUMENS
SEE NOTE *
MERCURY 11,000 L.
6,600 LUMENS
MERCURY 21,000 LUMENS
FLUORESCENT 21,200 LUMENS OR 10,600 LUMENS
FLUORESCENT 37,200 LUMENS POWER GROOVE
INCANDESCENT 2,500 LUMENS
MERCURY 3,500 LUMENS
FLUORESCENT 2,700 LUMENS
*NOTE: THREE INCANDESCENT FIXTURES ON EACH POLE INDIVIDUALLY SWITCHED.
RW - WITH NO CONTROL OF LIGHT.
SO - WITH HALF CONTROL OF LIGHT.
CR - WITH FULL CONTROL OF LIGHT.
VARIOUS POLE SPACINGS LIGHT & DARK ROAD SURFACES.
CENTRAL MAINE POWER COMPANY
SERVICE BUILDING AUGUSTA, MAINE.

**CHART SHOWS** layout of Central Maine's street lighting demonstration area at the Augusta headquarters. Scale is 1 in. = 40 ft

## EEI Streamlines 1960 Sales Conference

Edison Electric Institute is planning to streamline its 1960 Sales Conference. The Conference will run 2½ days compared to the 3½-day session of previous years.

The 1960 Conference will be held at the Edgewater Beach Hotel, Chicago, from April 4-6. The first day will be devoted to committee meetings. Tuesday morning will be for marketing sessions and the General Sessions will be held on Tuesday afternoon and Wednesday morning. The Conference will close with the General Luncheon on Wednesday noon.

The Awards Luncheon will be held on Tuesday noon. The Farm Luncheon, PUAA Luncheon and Home Service Breakfast will not be held next year.

The Conference was streamlined to get a "more dynamic, compact-type meeting" according to James T. Coatsworth, commercial director of EEI.

## Better Highway Lighting Shown in New Booklet

A booklet which makes a plea for better lighting on super highways and shows how it can be done has been prepared by the Street & Highway Safety Lighting Bureau.

Sections in the booklet cover traffic accident figures which show there is an "urgent need for highway lighting;" how proper lighting will prevent accidents; legislation which can be enacted to get the needed street lighting; where lighting should be installed; and how much lighting is needed.

Copies may be obtained from: Street & Highway Safety Lighting Bureau, 1400 Terminal Tower, Cleveland 13, Ohio.

## Power Companies Join Seventeen Contest

Over 300 electric power companies will help to promote electric appliances in cooperation with *Seventeen* Magazine in its 6th annual "favorite recipe contest." The nationwide competition is designed to stimulate teen-age interest in creative cookery using electric appliances.

The 1960 contest will be conducted in cooperation with Edison Electric Institute's Live Better Electrically program and the National Electrical Manufacturers Assn.

Winners will receive electric housewares prizes.

## Electric Heating Helps Stop Erosion

A manufacturer of unit steps has installed electric heating to help melt snow and ice, and do away with the errosion caused by the use of salt.

In winter months the natural tendency is to apply salt to rid steps of hazardous ice and snow. Salt tends to flake concrete after several years of use.

In the photo, a Chromalox electric heating representative and a Dayton Power & Light Co power salesman look at one of the electrically heated steps they sold to the firm's owner.

An 80-ft loop of 400-w, 120-v heating cable with 10 ft of non-heated extension cord was installed in the unit step form by clamping the heating cable to the steel mesh reinforcement with seat cover clamps. After the step had been poured, cured, and removed from the form it was set outside and plugged in. Water which had been placed on the step and frozen was melted off in a half an hour.

## COMPETITOR'S CORNER

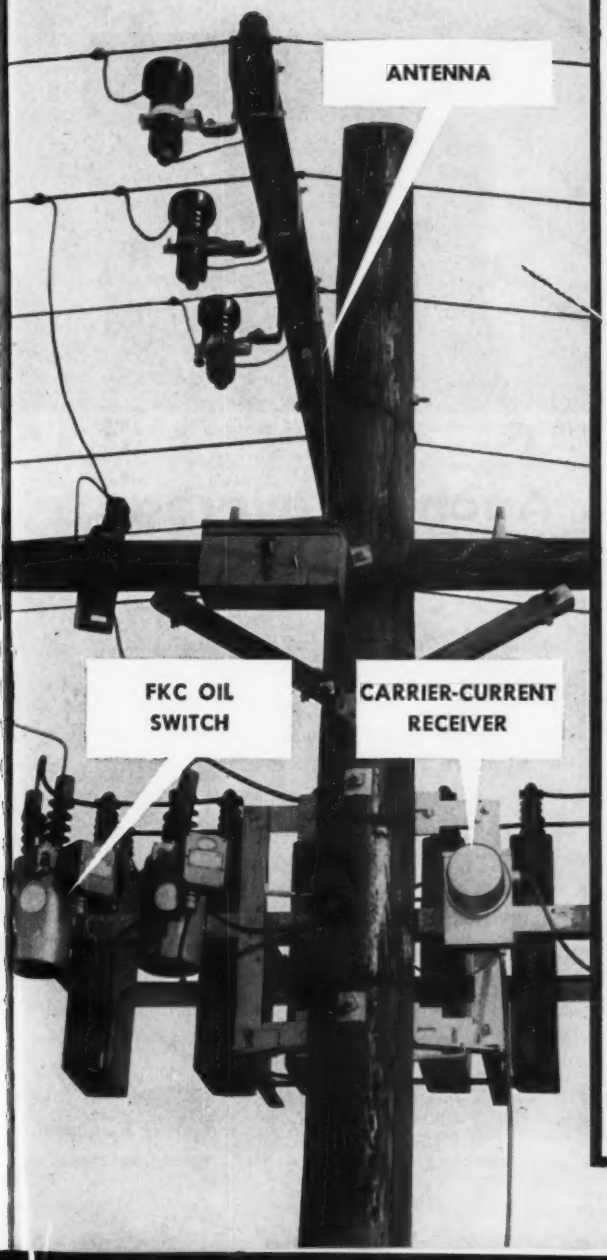
**A 10% increase** in the sale of gas appliances and equipment in 1959 has been predicted by the Gas Appliance Manufacturers Assn. Manufacturers also expect sales to increase through 1960 and that next year's sales volumes will exceed 1959's by 3.8% on the average. However, the average percentage increase could be as much as 11.7%, since percentage increases can vary from product to product, according to an article in *Gas Age*. New unit sales peaks are expected for built-in ranges, automatic water heaters, warm-air furnaces, boilers and vented recessed wall heaters.

**The gas utility industry** has added 11 million house heating customers since 1949, according to the American Gas Assn. More than 18 million homes now are heated with gas, and it is expected to reach 22.2 million by 1961.

ANOTHER GENERAL ELECTRIC ***Kilovar Plus . . .***

# More Economical System Operation Achieved with Remotely Controlled Capacitors

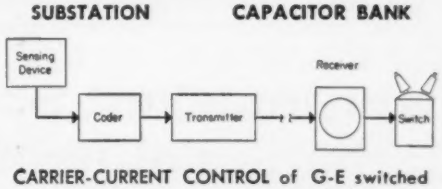
## General Electric Switched Pole-top Capacitors with Carrier-current Control Help Baltimore Gas and Electric Reduce the Cost of System Voltage Regulation.




**Carrier-current control of General Electric switched pole-top capacitors enables Baltimore Gas and Electric Company to hold most economically good voltage levels over the entire system.** Remotely controlled capacitor banks installed on feeders also contribute to more economical operation by reducing power losses and releasing system capacity. The system no longer has to transport vars from the generator to the load area.

**CONVENTIONAL CONTROLS** respond only to time or conditions at the capacitor site. BG & E found they did not permit maximum use of capacitors on its feeders.

**CARRIER-CURRENT CONTROL** responds to system reactive requirements measured at the substation. Then this control remotely switches the capacitors on the feeders so that vars are supplied to the load where and when they are needed, and in quantities required for most efficient system operation.




**CARRIER-CURRENT CONTROL** of G-E switched pole-top capacitors uses a sensing device at the substation bus to detect conditions that exceed preselected limits. A coder initiates action. Tone signals are transmitted by carrier over distribution lines to receivers on capacitor racks, and banks are switched on or off in a predetermined sequence.

**BALTIMORE GAS AND ELECTRIC** has found that the slightly higher cost of the carrier-current control is more than offset by the benefit of improved system regulation utilizing high distribution power factors. **DISCOVER HOW** G-E switched pole-top capacitors with carrier-current control can help your system. Contact your nearest General Electric Apparatus Sales representative, or write to Section 445-24, General Electric Company, Schenectady 5, N. Y.

**GENERAL ELECTRIC**

New screw anchors are installed in minutes with hole-boring equipment.

# Power-Installed Screw Anchors average 5 to 8 man-minutes for complete installation

**TYPICAL INSTALLATION TIME***

| No. of Men | Total Time | Man-Minutes |
|---|---|---|
| | 78 Square Inch Anchors | |
| 2 | 1½ minutes | 3 |
| 2 | 2¾ minutes | 5½ |
| | 100 Square Inch Anchors | |
| 2 | 2 minutes | 4 |
| 2 | 2½ minutes | 5 |
| | 143 Square Inch Anchors | |
| 2 | 2¼ minutes | 4½ |
| 2 | 3 minutes | 6 |
| 2 | 3½ minutes | 7 |
| | 176 Square Inch Anchors | |
| 2 | 3 minutes | 6 |
| 2 | 5 minutes | 10 |

*Variation in installation time for given anchor sizes indicates various soil conditions and different types of installing units.

**Latest advance in anchoring technique speeds line construction . . . realizes greater value from investment in hole-boring equipment**

If your company uses power hole-digging equipment for line construction, you can now use that equipment to install the new line of Chance Screw Anchors.

Chance Power-Installed Screw Anchors, ranging from 78 to 176 square inches in area, can be speedily installed in all types of soil, except extremely rocky soil. Your present power boring equipment, regardless of type, can be easily adapted to power anchor installation. Only one new part is needed—the wrench shown on the next page. This wrench transmits torque from the power equipment directly to the specially designed hub on the anchor helix. Since the anchor rod is not subjected to torque, it only has to be heavy enough to support the guy load—a cost-saving factor.

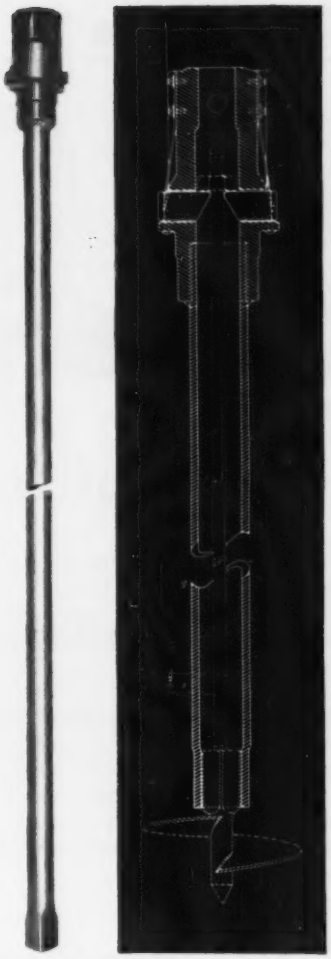
Installation procedure is extremely simple. *Step one* is to remove the Thimbleye or Twineye nut and slide wrench on the anchor. *Step two* is to fasten the wrench to the "Kelly Bar" of the power-digger, or, to fasten the wrench on the pilot bit of the auger using an adapter. *Step three* is to drive the anchor with the power equipment.

*Step four* is to release the wrench from the anchor and retrieve it from the ground. (The spring-loaded "dogs" that lock rod in position are easy to release.) *Step five* is simply replacing the Thimbleye on the end of the rod—your anchor is ready for hooking up the guy wire.

These five steps are accomplished in a matter of minutes. Repeated time tests in various types of soil prove that Power-Installed Screw Anchors averaged only 5 to 8 man-minutes for a complete installation—*from the time the equipment was moved into position until the anchor was ready for the guy!* The typical installation time tables at the left show actual times clocked during tests with power company personnel.

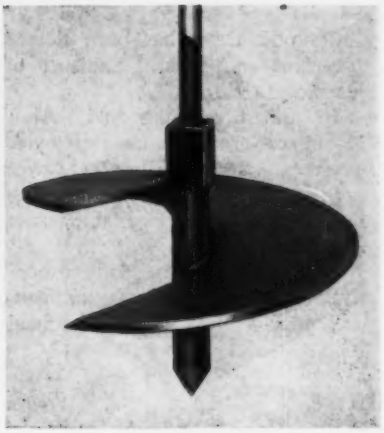
## PULL TESTS PROVE HOLDING POWER

During the engineering and development stages of these Power-Installed Anchors, several hundred tests were made to check the anchoring dependability of power-installed screw anchors. Each anchor was pulled by the mobile testing unit shown below to determine maximum holding power. The Pull Test Data Tables at lower right show the results of typical pull-tests. Complete test data is given in Bulletin 868. Address your bulletin request to...



THE ONLY PART NEEDED is this special wrench. (Diagram shows how it fits the anchor.) Wrenches are made to fit all popular makes of earth-borers.

THIMBLEYE and TWINEYE guy-wire nuts are available. They distribute pulling stresses uniformly and keep guy wire from spreading, kinking, or bending.

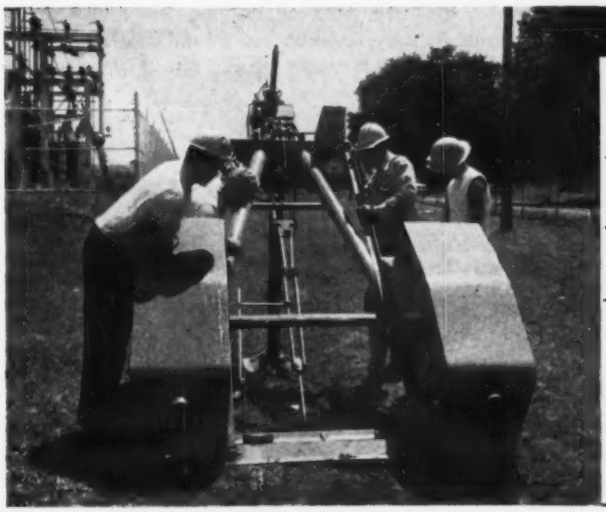


SHARP CUTTING HELIX of high strength structural steel is tapered to minimize earth disturbance. Special hub fits lower part of wrench.

**A. B. CHANCE COMPANY** CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

CA59-23



**PULL TEST DATA**

| | Load at Creep*, Lbs. | Pull-out Load**, Lbs. |
|---|---|---|
| 78 Sq. In. Anchors | 17400 | 17800 |
| | 13900 | 14900 |
| | 17600 | 20000 |
| 100 Sq. In. Anchors | 20000 | 21500 |
| | 17800 | 18400 |
| | 21000 | 21500 |
| 143 Sq. In. Anchors | 17600 | 18600 |
| | 23600 | 25100 |
| | 21600 | 22600 |
| 176 Sq. In. Anchors | 24300 | 25300 |
| | 22000 | 24200 |
| | 22000 | 24200 |

Load at Creep*—Test gauge reading closest to 4" creep. Allows for rod-stretch and initial settling of anchor.

Pull-out Load**—Anchor continued to creep when load was sustained at this figure.

For ultimate Soil-Anchor holding strengths in different soil classes see the Chance Catalog.

# News About People

DAVIS

HOEFLE

FLAHIE

BARKER

## Davis Elected President of Toledo Edison

John K. Davis has been elected president and general manager of the Toledo Edison Co.

In other appointments, Alois Hoefle was made administrative vice president, John H. Barker, vice president in charge of public relations, and Charles E. Flahie, chief electrical engineer.

Davis was most recently executive vice president and assistant general manager. In 1929, he joined Cities Service Co, former parent concern of Toledo Edison, as a cadet engineer. He also worked with the Public Service Co of Colorado before going to East Tennessee Light & Power Co. After the war he became personnel director was made vice president and a director in 1949 of Toledo Edison.

Hoefle joined Toledo Edison in 1925 as a distribution engineer. In 1946 he was made superintendent of the system operating department. He was named chief electrical engineer in 1953.

Barker joined Toledo Edison in 1942 as publicity director and employee magazine editor. He became director of public relations in 1946.

Flahie has been with the utility since 1931. He trained as a cadet engineer in Colorado and became transmission and distribution engineer in 1950.

## Moses Made VP at Western Mass

Marlowe G. Moses has been elected vice president and chief engineer of the Western Massachusetts Electric Co.

He joined Western Mass in 1945 as a planning engineer. Before that he had been employed by the Northwestern Service Corp in South Dakota and by Northern States Power Co where he was assistant manager of the planning department.

From 1942 to 1945 he was on a special assignment at Harvard University in a program sponsored by the National Defense Research Committee in the administration of military research and manufacturing.

In 1946 he became assistant chief engineer of Western Mass and in 1957 chief engineer.

## Blaw-Knox Names Rodgers Senior VP

William Rodgers has been named senior vice president of Blaw-Knox Co.

He joined the company in 1953 and in the same year was named vice president and general sales manager.

In his new post he will continue as general sales manager. He was elected a director of the company in 1956.

Before joining Blaw-Knox, he was in the construction materials business and the motor transport field.

*(More News About People on p 136)*

New

# "D" COATING

## adds life to strand

### ...even in highly corrosive atmospheres

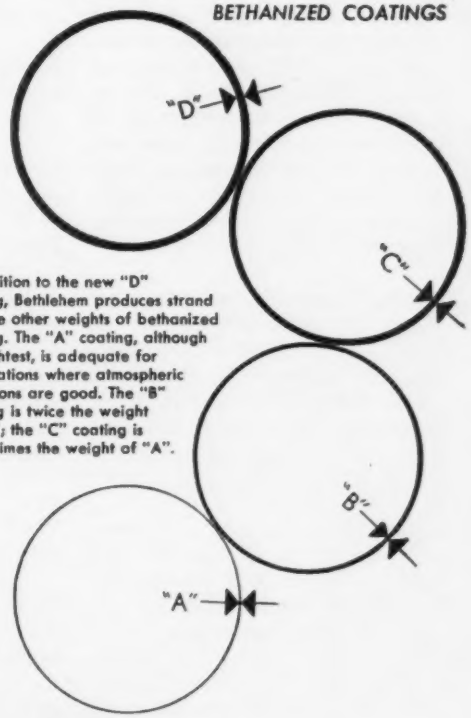
Bethlehem strand with the "D" bethanized coating has a tightly bonded zinc armor that's four times heavier than the economical "A" bethanized coating. Bethlehem's "D" coating, of 99.9 per cent pure zinc, is applied to the strand wires by our unique electrolytic process. Not only is the coating ductile, but it is also completely uniform in thickness.

If you have any questions about Bethlehem strand, or its four weights of bethanized coating, the nearest Bethlehem sales office will be glad to talk them over with you, or write us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
*Export Distributor:* Bethlehem Steel Export Corporation

**BETHLEHEM STEEL**

*CHOOSE FROM FOUR BETHANIZED COATINGS*




In addition to the new "D" coating, Bethlehem produces strand in three other weights of bethanized coating. The "A" coating, although the lightest, is adequate for applications where atmospheric conditions are good. The "B" coating is twice the weight of "A"; the "C" coating is three times the weight of "A".

BETHLEHEM STEEL

# Carpenter Steel Elects New President

John Moxon has been elected president of Carpenter Steel Co. Frank R. Palmer has been made chairman of the board.

Moxon, who was formerly executive vice president, will assume responsibilities as chief executive officer. He was associated for 14 years with the Guaranty Co of New York and the former Guaranty Trust Co of New York, now the Morgan Guaranty Trust Co of New York. He started with Carpenter as secretary, treasurer and director in 1944. He was elected vice president, secretary and treasurer in 1953, and executive vice president in 1957.

Palmer started in the steel industry with Midvale Steel Co in 1915. He joined Carpenter in 1917 as foreman in the company's electric furnace melting department. From 1918 to 1928, he was in the company's metallurgical department. He then became assistant to the president, and was elected vice president in charge of sales in 1941. Seven years later, he was elected president.

## PERSONAL BRIEFS

**Arthur P. Sussman** has been promoted to assistant superintendent of systems operations at Toledo Edison Co.

Three personnel changes have been made at Virginia Electric & Power Co. **W. Bruce Vaughan, Jr** to manager of VEPCO's Woodstock branch; **Calvin T. Lucy, Jr,** assumes Vaughan's former position of supervisor of employee training and information at Richmond; and **Hugh A. Danner** becomes estimating supervisor, electric distribution department, Norfolk.

**W. L. Westbrook** has been promoted to division manager of Georgia Power Co's Atlanta Division. He succeeds **H. G. Moore,** retired. **John J. McDonough,** president of Georgia Power, has been elected to the board of directors of Pepperell Manufacturing Co.

**John B. Deck, Jr,** lighting engineer for Texas Power & Light Co, was recently elected vice president of the Illuminating Engineering Society's Southwestern region.

New director of Detroit Edison Co's civil defense department is **Rear Admiral Leon J. Jacobi.**

**Robert R. McLagan** has been made superintendent of Pacific Power & Light Co's Portland power district.

**Lloyd E. Wallace** has been made Willamette Valley power superintendent of Pacific P&L.

**John Riley** has succeeded **John Dunstan** as manager of the Spenard (Alaska) Public Utility District.

**George E. Billings** has been named to head the new industrial development department of Kansas Gas & Electric Co. He was formerly manager of the Port Huron, Mich., Industrial Development Corp.

**Ernest L. Grove Jr** has been named to the newly created post of executive assistant to the vice president and treasurer of Connecticut Light & Power Co.

**Joy E. Wilson** has been named home service advisor for Potomac Edison Co's Cumberland district.

**Henry W. Berry,** has been promoted to the Mississippi Power & Light Co's general office in Jackson.

Wisconsin Public Service Corp has divided its Wisconsin Valley division. **W. W. Boettcher** will manage the new Rhinelander division, and **P. C. Dahlberg** will manage the new Wausau division. **L. W. Pfeiffer** has become manager of the Merrill district. **M. H. Montross,** manager of the Valley division will retire on September 30.

**Dale W. Anderson** has been appointed manager of division operations for Northern Indiana Public Service Co. He succeeds **Walter H. Kussmaul,** formerly vice president of division operations, who has been named vice president of purchasing and stores.

**H. H. Ramsey** retired from Southwestern Electric Power Co.

**Calvin T. Hughes** has retired as vice president and consulting engineer of Connecticut Light & Power Co.

Union Electric Co has named **Lee R. Crawford** line clearance supervisor and **Gerald D. Spann** assistant electric power plant engineer at the Venice Plant.

Mississippi Power & Light Co has made the following promotions: **Al Hardin** to assistant residential sales director; **G. W. Drane** to development engineer; **Fred Purser** to industrial sales engineer at Jackson; and **Leon Young** to Senatobia as industrial sales engineer.

Minnesota Power & Light Co has made these changes: **George W. Sheils** has been promoted to steam production analyst; **Burton J. Tranvik** to right-of-way engineer; and **Jerome N. Roettger** to Little Falls division engineer. **Ralph A. Barker,**

(*Continued on p* 138)

# 3 NEW G-E MOTORS AND 42 QUALITY IMPROVEMENTS

A family appearance in power station motors and 42 basic design improvements are now available from General Electric. The three new enclosures shown here enable electric utilities to select power station motors with the same modern appearance. And all of these new motors contain the same advanced features, painstakingly engineered to meet electric utility standards of reliability.

Among the 42 quality improvements available on all G-E boiler feed pump motors, are:

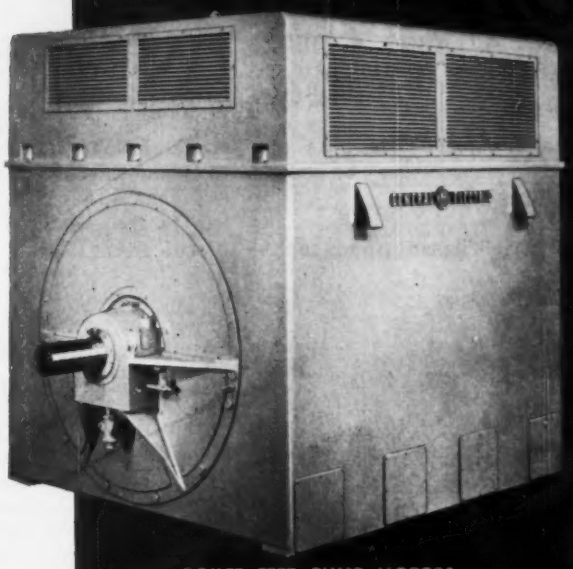
- **Polyseal* insulation system**—sealed against moisture; resists fly ash, most other abrasives.
- **Patented tying system**—heat hardened Permafil glass rovings hold end turns of form wound coils in a vise-like grip for maximum support.
- **Rugged frames**—provide added rigidity and strength required for power station service.
- **Extremely low noise level**—now possible with proven acoustic treatment.
- **Stator connections**—all brazed for more uniform strength, reliability.
- **Controlled slot wedging**—provides tight, stable fit, virtually eliminates coil looseness and resultant wear.

**FOR THE COMPLETE STORY** on G.E.'s 3 new power station motors and 42 quality improvements, contact your G-E Apparatus Sales engineer or write Section 884-3, General Electric Co., Schenectady 5, New York.

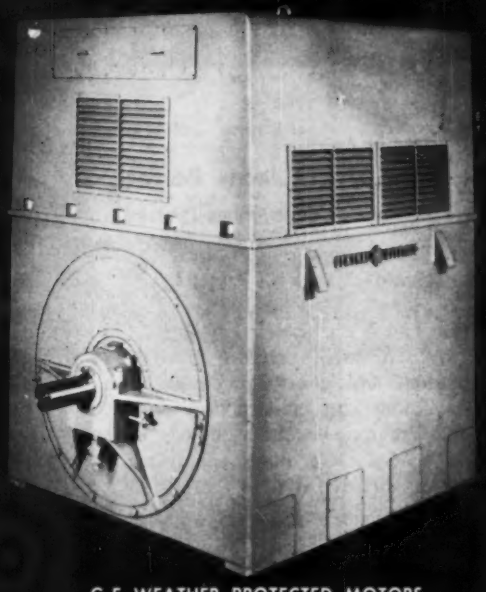
*Trademark of General Electric Co.

*Progress Is Our Most Important Product*

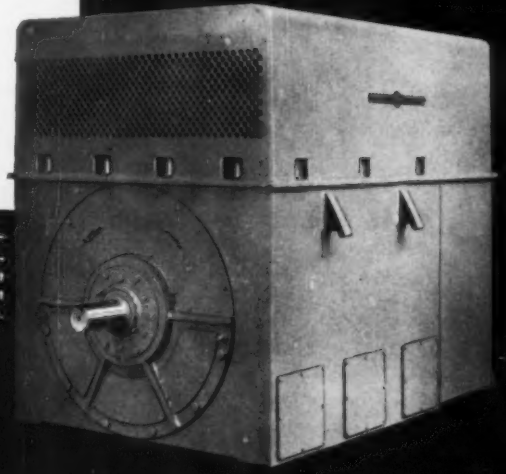
GENERAL ELECTRIC



BOILER FEED PUMP MOTORS—
Large 2-pole dripproof motors are acoustically treated for quiet operation—give long, reliable service.



G-E WEATHER PROTECTED MOTORS—
give better protection against rain, snow—even hurricanes—exceed NEMA Type II definition.



G-E TUBE-COOLED TEFC MOTORS—
are designed for easy disassembly, maintenance and inspection; computers select optimum number, size and arrangement of tubes for most effective ventilation.

another G-E PROJECT '8000' development

PROJECT '8000'—
a major General Electric program of research, product redesign, advanced manufacturing and improved customer service on a-c motors 150- to 6000-hp.

engineer, and **Victor A. Miller,** power generation assistant, have retired.

**Warren J. Carson** has been appointed assistant secretary of Ebasco International Corp.

**Walter E. Selkinghaus** named superintendent of Carolina Power & Light Co's new generating plant near Hartsville.

**R. D. Elliott,** vice president and consulting engineer of Dallas Power & Light Co, has been made a Fellow in the American Institute of Electrical Engineers.

## Loucks Named Commercial Manager at Duquesne Light

David W. Loucks has been appointed manager, commercial sales department, at Duquesne Light Co.

Loucks, who has been with Duquesne Light for 33 years, had been director of the commercial sales.

Since starting with the company, he has held the positions of director of industrial sales and steam sales, supervisor of industrial electric and steam sales, and power and steam sales engineer.

## Drain Joins Porter as Vice President

James A. Drain has joined the executive staff of H. K. Porter Company Inc as a vice president.

He had been with Joy Manufacturing Co, most recently as vice president and general manager of the mining and construction division. Previous to that, he was in charge of the Canadian operations of the company for nine years.

## PS of New Hampshire Names Swain to New Post

Harold S. Swain has been assigned to the newly created post of production manager for Public Service Co of New Hampshire. He had been division manager of generating facilities since 1956.

In his new post he will supervise activities of 24 hydroelectric and five fuel burning system plants.

He was with the Electric Bond & Share Co for 12 years, and has also been a construction and supervisory manager at Portsmouth for Public Service.


# EMPLOYMENT

# ELECTRICAL ENGINEER

Immediate opening with South Dakota State Engineer's Office. Desire qualification in electrical circuit design for buildings, underground and overhead service, substations and power plants.

**Starting salary $8400.**

**Send resume to:**
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**State Capitol,**
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Thoroughly experienced in cut in, test, and trouble shooting all types of modern protective relays, substation control circuits, and Leeds & Northrup or similar tie line recorders, telemetering and load control devices. Must have proven record of ability to work without immediate supervision. Excellent fringe benefits. Three step salary range: $3.13—$3.17—$3.22/hr, 6 mos. intervals. Headquarters to be in St. Petersburg with considerable travel. Age to 49. Present employer will not be contacted without your permission.

Address complete resume of experience and education to: FLORIDA POWER CORP., P. O. Box 4042, St. Petersburg, Fla., Attn: Poe S. Herden, Empl. Mgr.

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**Excellent opportunity in relay test section of Massachusetts utility. Good knowledge of electronics a necessity. E.E. degree helpful. Salary commensurate with experience. Write resume of experience, education, personal data, and salary requirements. All held in strict confidence.**

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**Wanted—Graduate Electrical Engineers**—Electric Utility in North Jersey area. Some experience in transmission and distribution desired. Please answer giving education, experience and salary expected. F-2345, Electrical World.

**Superintendent of Metering. Graduate EE** with minimum 6 years experience residential, commercial and industrial watthour meter testing and maintenance with operating utility. Ability to test, adjust and repair watthour meters, organize and train test personnel, formulate test procedures, establish record system, and specify and purchase meters, test equipment and spare parts is essential. Location Middle East. Salary $16,000 to $18,000 with two year contract and other benefits. P-2440, Electrical World.

**Utility Rate Engineer—Nationally-known** management consulting organization needs man with operating utility rate experience, preferably with engineering degree, for work with clients. Extensive travel. Salary commensurate with training and experience. Send resume and salary requirement in first letter. Our employees have been advised. Replies confidential. P-2524, Electrical World.

### SELLING OPPORTUNITY OFFERED

**Representative wanted for manufacturer of** street lighting equipment pole line specialties. Full particulars. RW-9821, Electrical World.

### FOR SALE

**Available—GE Mercury Arc Light Spare** Parts, odds and ends—tubes, cc transformer coils, and electrodes. Available to first inquirer for cost of packing and shipping. Contact: Bureau of Chambersburg, Pennsylvania, J. G. Cree, Manager of Utilities.

**2—Oscillograph, Automatic, Cat. 498010062, Serial Nos. 730474 and 730476, Type PM13-B2, G.E. 6 Element, less galvanometers, each complete with paper holders, catalog 5161486G1 and 5161-486G2 used in good condition, $395 each or $695 for pair.**

**1—Frequency Recorder, L & N 59 to 61 cycles, 10" chart, micromax type S, used but in good condition.....$350.00**

**2—Lincoln watt demand Graphic Meter, Type CCW, 120 volt, 5A, 60 cycle, 3P3W, unused .....$35.00 each**

**1—Power Factor Recording Meter, Portable, .6 lag to .6 lead, 115/230 volt, 5A, 3P3W Model 8CD13ECA10 used but in good condition.....$127.50**

**1—Frequency Recording Meter Flush Switchboard, 55-65 cycle, less external impedor, Type CD27, G.E. 120 volt, Model 8CD27FAA13, Serial #3278332. $65.00**

**800 Ft.—Lead Covered #2AWG stranded, 15 KV cable 16/64 VC, 5/64 lead, new on original reel, G.E. $.50 Ft. for lot.**

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3—1000 kva Standard, 1/69000/4160Y/2400
3—1000 kva Standard, 1/34400/480
3— 200 kva Westinghouse, 4800—240x480
3— 100 kva GE., 2400/4160Y—120x240
3— 75 kva G.E., 2400/4160Y—120x240

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**To head Electrical Department of a long-established and growing Architect-Engineer firm. Must have degree and registration. Supervisory and Administrative talent essential. Salary open. Location, New England.**

**Send resume of experience, references and record of past earnings to**

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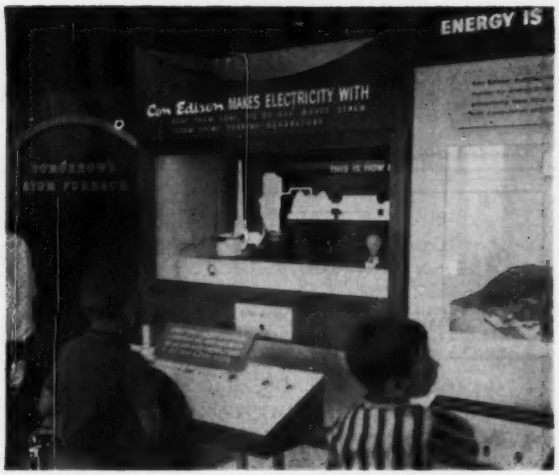
330 West 42nd Street, New York, N. Y.

**LABOR DAY WEEKEND** brought 7,500 visitors to site




**KIDS AND ADULTS,** too, played engineer in exhibit hall

# Con Ed Finds Interest In Atom Isn't Passe

The emphasis on the space age hasn't dimmed interest in nuclear power. Consolidated Edison Co of New York, at least, has come to this conclusion after a surge of New Yorkers took the company up on an invitation to view progress at Indian Point Nuclear Power Station, some 40 miles from downtown Manhattan. About 7,500 people took a first hand look during the Labor Day weekend and as many as 200 a day have visited the site during afternoons since then. A $5,000 exhibit shows how the plant will operate and the exhibit building's rear promenade permits a grandstand view of construction. The exhibit will be housed in the administration building after the plant's completed; the present structure will be used for storage.

**GRANDSTAND VIEW** of construction climaxes the visits

## Advertising Index


Allis-Chalmers Mfg. Co..111, 113, 115, 117
Aluminum Co. of America..... 54
American Brass Co.....96, 97
American Chain & Cable Co., Inc.
Page Fence Association..... 116
Anaconda Wire & Cable Co.....119, 120
121, 122

Babcock & Wilcox Co.....64, 65
Bethlehem Steel Co..... 135
Brown Boveri Corp..... 17

Chance Co., A. B.....132, 133
Combustion Engineering .....30, 31
Continental-Diamond Fibre
Sub Budd Co..... 41
Cornell-Dubilier Electric Corp..... 40

Directory of Engineers..... 143
Dow Chemical Co.....108, 109
Dowell ..... 107
du Pont de Nemours & Co. (Inc.)
Elastomer Chemicals Dept..... 59
Polychemicals Dept. ..... 32

Electromode Div. Commercial Controls
Corp. ..... 47
Engineers, Directory of..... 143
Enjay Co., Inc. ..... 98

Federal Pacific Electric Co.....12, 13

G&W Electric Specialty Co..... 103

General Electric Co.
Apparatus Dept.....2nd Cover, 33, 34
35, 39, 83, 84, 85, 86, 88
89, 92, 93, 131, 137
Large Lamp Dept..... 91

Graybar Electric Co., Inc..... 7
Grinnell Co. .....10, 11
Gulf Oil Corp. ..... 53

I-T-E Circuit Breaker Co.
Victor Insulators Div..... 95
Indiana Steel & Wire Co., Inc..... 114

Johns-Manville ..... 52

Kaiser Aluminum & Chemical
Sales Inc. .....60-61
Kaiser Engineers Div.
Henry J. Kaiser Co..... 38
Kerite Company ..... 66
Kuhlman Electric Co.....55, 56, 57, 58

Lapp Insulator Co., Inc..... 4
Line Material Industries.....25, 26, 27

Moloney Electric Co.....4th Cover

Natvar Corp. ..... 63

Ohio Brass Co..... 43, 44, 45, 46
Okonite Company .....8, 9

Page Fence Assoc. Div.
American Chain & Cable Co., Inc... 116

Pennsylvania Transformer Div.,
McGraw-Edison Co. .....19 20
Preformed Line Products Co....104, 105

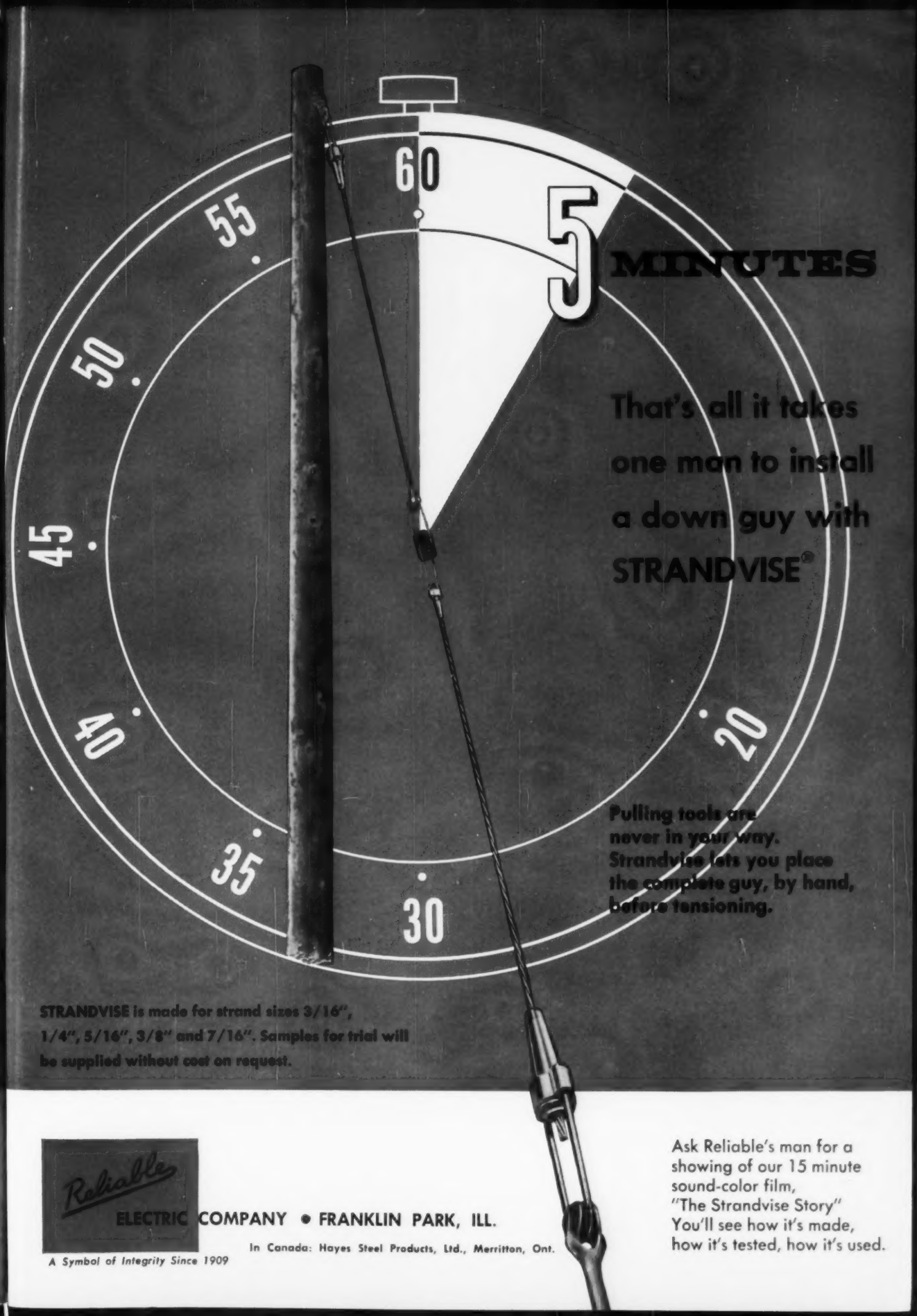
RT&E Corp. ..... 62
Reliable Electric Co.....3rd Cover
Reynolds Metals Co.....28, 29
Roebling's Sons Corp., John A...50, 51
Rome Cable Corp.....14, 15

S&C Electric Co.. .....36, 37
Sangamo Electric Co..... 6
Searchlight Section ..... 143
Sierra Electronic Corp..... 112
Southern States Equipment Corp.... 118
Sylvania Lighting Products..... 42

United States Steel Corp..... 18

Wagner Electric Corp.....48, 49
Westinghouse Electric Corp.....100, 101
127, 128
Westinghouse Electric Corp.
Sturtevant Div. ..... 16

PROFESSIONAL SERVICES ..... 139
CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.
EMPLOYMENT OPPORTUNITIES .... 138
EQUIPMENT
(Used or Surplus New)
For Sale ..... 138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Pulling tools are never in your way. Strandvise lets you place the complete guy, by hand, before tensioning.
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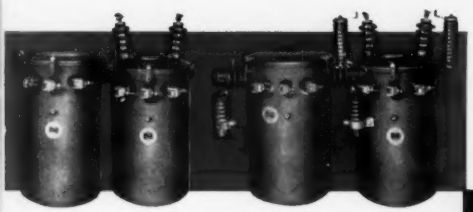
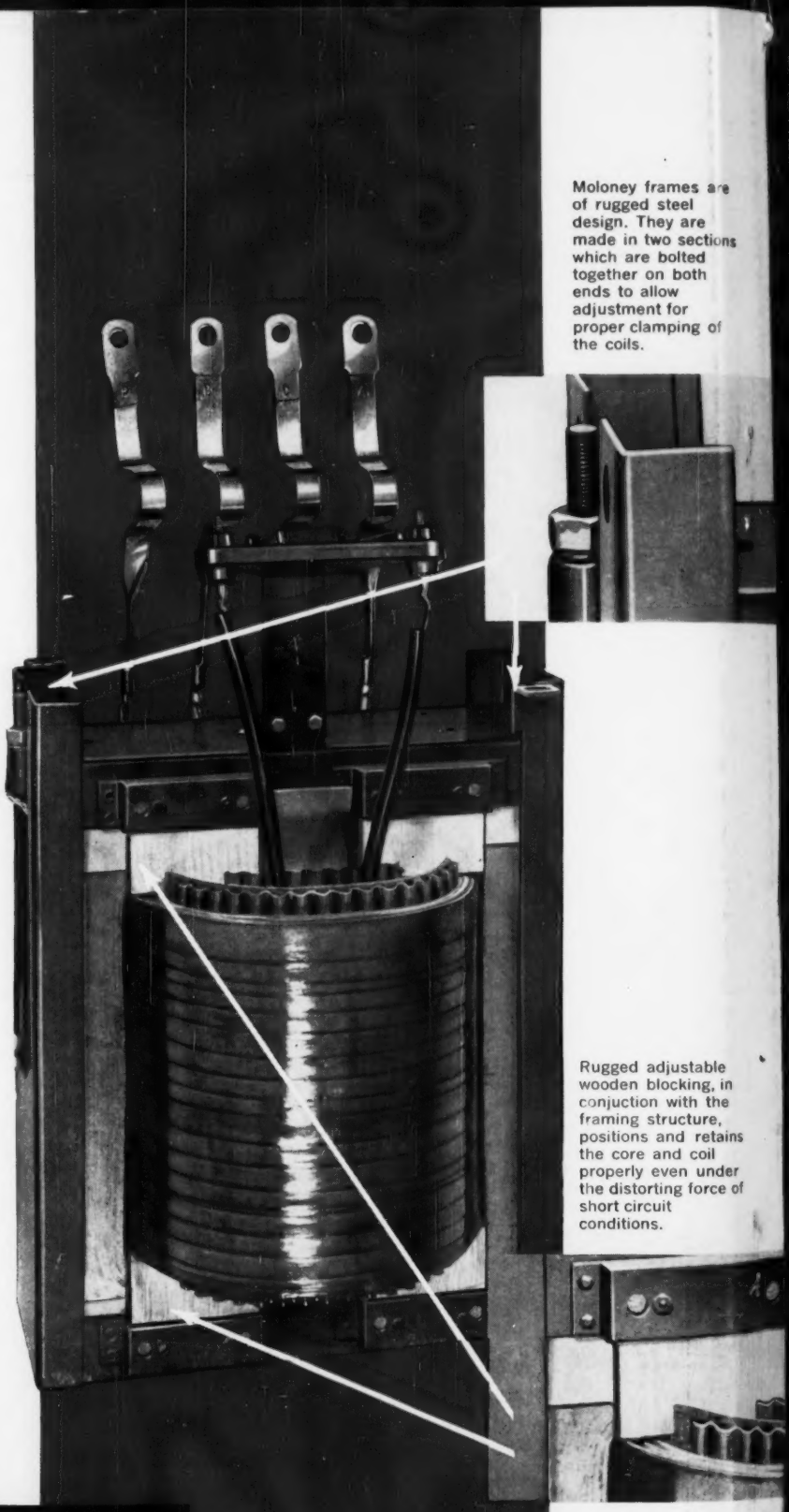
# MOLONEY DISTRIBUTION TRANSFORMERS

The unique combination of the Moloney Core, a low impedance coil, sturdy frames and adjustable blocking gives the user of Moloney distribution transformers efficiency, economy and long service.

- Moloney Core has low exciting current.
- Low impedance coil improves voltage regulation.
- Sturdy frames assure a rugged, compact unit.
- Adjustable wood blocks retain the coils in position even under short circuit conditions.

Specify the distribution transformers designed, built, and tested for superior performance. Specify Moloney Transformers . . . All Along The Line.





Moloney frames are of rugged steel design. They are made in two sections which are bolted together on both ends to allow adjustment for proper clamping of the coils.

Rugged adjustable wooden blocking, in conjuction with the framing structure, positions and retains the core and coil properly even under the distorting force of short circuit conditions.

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